THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The purchase by the United States Steel Corporation of 225,000 tons of Bessemer iron last week for delivery between Oct. 1, 1902, and April 1, 1903, is the most significant development in the iron trade this year. At $16.50 at the furnace this iron was sold on a basis about $2 lower than the current price of No. 2 foundry iron at Central Western furnace, for delivery this year. The fact that half the capacity of merchant furnaces producing Bessemer iron is thus taken up for the six months mentioned, and at such a price, indicates confidence in the prolongation of strong conditions into next year, as well as the cooperation of large interests, both buying and selling, in maintaining a reasonable level of values. The buying of Bessemer iron, with deliveries extending 12 months beyond the date of purchase, is without precedent, apart, possibly, from occasional conversion deals. The merchant furnacemen were not a unit on this transaction and a number, rather than sell to the big corporation at the price named, are holding their iron to be sold in smaller lots at the higher prices now prevailing and to all appearances likely to prevail later in the year. In foundry iron the week has only emphasized the tendency of the market to cut loose from the attempts of the more conservative elements in the trade to control prices. Consumers are not all satisfied, apparently, with promises of iron sufficient to meet their wants, without accompanying definite contracts to make deliveries later in the year. The Southern companies announcing the continuance of the $12 price on No. 2 foundry iron at Birmingham have not resumed selling at that figure, but other furnaces are selling steadily at $14, Birmingham, and in some instances higher prices are secured. Northern furnaces have advanced prices also, not only on prompt deliveries, on which as high as $21 for No. 2 delivered has been paid, but on contract iron for the second half, which some furnaces are holding at $19 at furnace. Northern gray forge has sold at $18.25, Pittsburg, or $17.50 at Valley furnace, while Southern gray forge has been sold to Mahoning Valley consumers at $17, delivered. The situation as to steel promises to continue as at present indefinitely. The present basis for billets is substantially $32, Pittsburg. An effort to rehabilitate an Indian Bessemer plant has not proved successful, a supply of Bessemer iron not being obtainable. A 20,000-ton contract for rods has been transferred from an independent producer in the Pittsburg district to a steel corporation plant, because of an incapacitated rod mill. An important contract in furnished material is for 30,000 tons of plates and structural steel placed by a new steel car company. There are indications that considerable building will be carried over to 1903 because of the prices of material, which buyers must now secure through dealers if at all. Labor questions may assume more importance in the next 30 days. The demand of blast furnace workers in the two Valleys for an 8-hour day will be resisted. Men enough to man the furnaces cannot be secured under a three-shift regime. The strike at the Rochester & Pittsburg coal mines promises to continue indefinitely and a half dozen furnaces must find a new coke supply or shut down. The Connellsville coke output has been increasing and last week's output reached about 220,000 tons, or at the rate of nearly 11,500,000 tons a year. Foreign business, whether in pig iron or steel, is light. An Eastern concern is seeking to buy 10,000 tons of foreign low phosphorus Bessemer iron, and the steel corporation has inquired for 15,000 tons of foreign Bessemer.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, April 9.

The largest transaction of the week, as well as of the year, in the pig iron market was the purchase of Bessemer iron for delivery in the last quarter of this year and the first quarter of next year by the United States Steel Corporation. The total tonnage purchased was about 225,000 tons, a portion of this, aggregating nearly 200,000 tons, having been placed last week, while the remainder was purchased this week from the Bessemer Pig Iron Association. The price paid, $16.50 at the furnace, is considered extremely low in view of recent sales not only for delivery in the second quarter but in the third quarter as well. Inasmuch as the Valley furnaces are now catching up on their pig iron deliveries it is probable that some of the furnaces will ship a portion of the iron stipulated for fourth quarter delivery during the third quarter owing to the shortage already apparent during this period. All of the furnaces in the association did not avail themselves of the opportunity to close for their product for this six months period, believing that they should receive better prices and are holding their iron for the higher prices which are already prevailing. Bessemer iron for delivery to July 1 commands $18 at the furnace; for delivery in the third quarter $17.75 and $18 per ton is asked and a number of sales have been made at this price. The $20 point for foundry iron has been reached and No. 1 for delivery in the third quarter is being very generally universally held at this price, with No. 2 at $19.50, delivered Pittsburg. For prompt delivery carload lots are selling at $21 Pittsburg for No. 2. Forge iron also continues to advance in price, and we note the sale of 4,000 tons for delivery during August, September, October and November at $18.25 delivered, Pittsburg.

The United States Steel Corporation is in the market for foreign Bessemer iron, and if suitable deliveries can be secured will purchase 15,000 tons. However, owing to the continually advancing English market it is doubtful if the iron can be shipped to Pittsburg at less than $22 per ton. An Eastern concern is also in the market for 10,000 tons of low phosphorus Bessemer which cannot be delivered free of duty at tidewater at less than $21 per ton.

The inquiry noted last week for 90,000 tons of Bessemer iron has not yet been placed, and the indications are that it will not be placed owing to the general scarcity. The parties making this inquiry intended operating the Premier steel plant at Indianapolis, Ind., which has been idle for some time and which is in part dismantled.

The strike of the coal miners in the Western and Northern districts of Pennsylvania has not yet been settled, and the coke ovens in these regions have been shut down. A half dozen furnaces dependent upon the coke production of these districts are hard pressed for their regular supply, but up to the present time have not been compelled to bank or go out of blast. A firm stand has also been taken by the blast furnace operators in the Valleys against granting the demands of their employes for an eight-hour day. While no concessions will be

made in the hours it is probable that the matter will be compromised by granting the men an advance in wages, a course which already meets with the approval of the majority of the operators. If the furnace workers will not compromise in this way a strike will be declared on May 1 and operations in the Valleys will be greatly interfered with if not stopped altogether. It is not true, however, that the blast furnace workers have any strength in the Pittsburg district, and the furnaces of the big steel mills in this territory will not be affected by the strike from present indications at least.

The Standard Steel Car Co. last week placed an order with the Carnegie Steel Co. for 30,000 tons of plates and structural shapes for delivery during the last four months of the year. This is the first large order placed by this new car corporation, and when the plant is operating in full the total tonnage required annually will amount to about 125,000 tons, to say nothing of the castings and iron and steel shapes that enter into the construction of the trucks, bringing the total tonnage consumed up to fully 250,000 tons.

That the American Steel & Wire Co. has a much larger capacity for rolling rods than can be supplied by the steel mills of the United States Steel Corporation is indicated by the deal entered into with Jones & Laughlins, Ltd., whereby the former takes over the entire tonnage of rods booked by the latter for the next three months amounting to about 20,000 tons, the steel to be furnished by Jones & Laughlins, Ltd. This deal was made owing to the breaking down of the rod mill of Jones & Laughlins, Ltd.

PIG IRON.—All grades of pig iron continue to advance in price, and No. 2 foundry in carload lots has been selling during the week at $21. For delivery during the third and fourth quarters orders for 500 and 1,000-ton lots have been placed at $19.50, Pittsburg. Forge iron also shows considerable strength, and we note the sale of 4,000 tons for delivery from August through November at $18.25, Pittsburg. The sale of about 225,000 tons of Bessemer iron to the United States Steel Corporation for the six months period beginning with Oct. 1 and extending to April 1, 1903, will have much to do with holding the market stable, although the price paid was by no means satisfactory to all the furnacemen in the Bessemer Association. For delivery to July 1 sales of Bessemer iron amounting to 3,000 tons have been made at $18 to $18.25 at the furnace, and for delivery through the second half of the year the furnacemen are asking $17.50 to $17.75 at the furnace. Southern foundry iron is also commanding high prices despite the low prices at which some of the Southern producers are alleged to be holding their product. One large dealer in Southern irons has fixed his price for No. 2 foundry at $15 Birmingham or $19.15 Pittsburg. The strike of the miners employed by the Rochester & Pittsburg Coal & Iron Co. indirectly affects six furnaces located respectively at Buffalo and Tonowanda, N. Y.; Punxsutawney and Bellefonte, Pa. As yet the furnaces have not been compelled to bank, although the expected settlement with the miners has not been made. Two new foundry furnace propositions are under way. One furnace is to be located on Zug Island, near Detroit, and the other will be located at Canton, O. Both furnaces will have a capacity of about 350 tons per day. We revise quotations as follows, the wide spread on Bessemer representing the long-time contract sales of the week and the small sales for early delivery:

Bessemer, Valley	$16 50 to	18 25
Bessemer, Pittsburg	17 25 to	19 00
No. 1 Foundry	19 50 to	20 00
No. 2 Foundry	19 25 to	20 00
No. 3 Foundry	18 50 to	19 00
Gray Forge, Pittsburg	18 00 to	18 50
Chilled Basic, Valley	17 50 to	17 75
Chilled Basic, Pittsburg	18 25 to	18 50

STEEL.—We note sales of small lots of Bessemer billets at $32, Pittsburg, for delivery to July 1. One of the large mills in this district is selling flats to sheet manufacturers to be used in the place of sheet bars at $35 a ton. The demand for foreign steel is not very heavy, although we note the sale of 1,000 tons of foreign slabs at a price equivalent to $32.50, Pittsburg, for shipment west of this city. The rod mill of Jones & Laughlins, Ltd., is to be practically rebuilt and all the orders on the company's books have been turned over to the American Steel & Wire Co. Rods for shipment to July 1 command from $36 to $37 per ton.

FERRO-MANGANESE.—The foreign market on manganese is somewhat weaker than it has been for some time and quotations of $49 per ton are being made in this market. Domestic manganese is held at $52.50 per ton, delivered at buyer's mill.

SPELTER.—There has been a sharp advance in the price of spelter during the week and prime Western grades are held at 4.35c to 4.37½c, Pittsburg.

MUCK IRON.—The muck bar market is somewhat easier than for some time and neutral muck is held at $32.50 to $33 per ton.

SKELP.—The demand for skelp has fallen off somewhat owing to the big orders placed some time ago. Iron skelp, both grooved and sheared, is held at 2.05c to 2.10c, and steel skelp is held at 2c.

RAILS AND TRACK MATERIAL.—The demand for standard section seconds is large and in lots of more than 200 tons are being sold by the rail manufacturers at $26.60 per ton. We make the following quotations: Standard sections, 50 pounds and over, in lots of 200 tons and over, $28; car lots and less than 200 tons, $30; less than car lots, $32; light rails, 8 pounds, $45; 12 pounds, $42; 16 pounds, $39; 20 pounds, $37; 20 pounds, $35; 20 to 40 pounds, $33. Track material: Spikes, 2c to 2.05c; track bolts, square heads, 2.50c; hexagon heads, 2.65c; fish plates, 1.60c.

PLATES.—The demand for plates is growing better and the contract placed last week by the Standard Steel Car Co. for 30,000 tons of material contains a round tonnage of plates. Prices remain unchanged as follows: Tank plate, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c, and it ranges in price to 3c. Plates more than 100 inches wide, 5 cents extra 100 pounds. Plates 3-16 of an inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5 cents extra a hundred pounds for less than carload lots. Terms, net cash, in 30 days.

PIPES AND TUBES.—The heavy demand for all kinds of merchant pipe and casing, which set in the first of the year, continues and the tonnage that is now being placed is the heaviest in the history of the trade. We quote the following discounts to jobbers in carload lots, Pittsburg:

MERCHANT PIPE.

	Black. Per cent.	Galv. Per cent.
⅛ to ¼ and 11 to 12 inches	60	48
⅜ to 12 inches	67	55

Discounts below are to consumers in carload lots, Pittsburg:

BOILER TUBES.

Steel.

	Per cent.
1 to 1½ inches	47½
2¼ to 5 inches	65½
1¾ to 2¼ and 6 to 13 inches	60

Iron.

	Per cent.
1 to 1½ and 2¼ inches	41½
1¾ to 2¼ inches	43
2¾ to 13 inches	53

CASING.

	S. and S. Per cent.
2 to 3 inches	58
3¼ to 4 inches	63
4¼ to 12½ inches	65

BARS.—Demand for both iron and steel bars, owing to recent heavy buying, has fallen off to a large extent. Prices are, however, firmly maintained as follows: Bessemer steel bars, 1.60c; open-hearth, 1.70c; plow beams and cultivation beams, 1.60c, net; channels, angles, zees and tees, Bessemer under three inches, 1.70c; over 3 inches, 1.80c; bar iron, 1.70c to 1.80c, Pittsburg, with full freight added to point of delivery. Hoops and bands are quoted at 1.90c, full extras; refined iron bars, 2c and upwards.

SHEETS.—There is little change in the sheet situation, the demand for the heavier gauges continuing strong. Our quotations are as follows: Nos. 10 and 12, 2.40c to 2.50c; 14 and 15, 2.50c to 2.60c; 16, 2.60c; 18 and 20, 2.70c to 2.80c; 22 and 24, 2.80c to 2.90c; 26, 2.90c to 3c; 27, 3c to 3.10c; 28, 3.10c to 3.20c; 29, 3.25c to 3.35c; 30, 3.35c to 3.45c. Galvanized sheets are quoted at 70, 10 and 5 off in carload lots; less than carload lots, 70 and 10 off.

STRUCTURAL MATERIAL.—Owing to the high prices asked by dealers in structural material much building projected for this summer is being deferred to 1903. The large structural mills continue the following quotations: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c;

angles from 3 to 6 inches, 1.60c; universal mill plates, 1.60c.

WIRE AND WIRE NAILS.—At a meeting of the manufacturers, held last week, the price of cut nails was advanced 5 cents per keg. Demand for wire nails and wire products generally continues strong. We revise quotations as follows: Wire nails in carload lots, $2.05 per keg; smaller lots, $2.10 and $2.15; plain wire, $2 in carload lots and $2.10 in less than carload lots to retailers; galvanized wire $2.40 in carload lots; polished staples $2.20 and galvanized staples $2.60; painted barbed wire $2.60 and galvanized $2.90. These prices are quoted on a Pittsburg base, plus the actual freight to destination. Cut nails are held at $2.05 in carload lots and $2.10 in less than carload lots, Pittsburg, plus freight to destination.

MERCHANT STEEL.—Tool steel manufacturers report that the demand for their product is very strong and the largest producer, the Crucible Steel Co. of America, has orders on its books sufficient to keep the mills in operation for the next six months. We make the following quotations: Turned, cold rolled and ground shafting in carload lots is quoted 50 off, and in less than carload lots, 45 off; tire steel, 1.70c in carload lots and 1.80c less than carload lots; toe calk, 2.10c to 2.25c; sleigh shoe, 2c to 2.25c; machinery steel, 1.50c; smooth machinery steel 1.75c. Tool steel, 7 cents and upwards.

OLD MATERIAL.—The scrap market has reached such a point that it is more profitable for mills to use pig iron in the place of heavy melting stock, and in many cases open-hearth steel manufacturers are waiting for a lower scrap market, using pig iron in the meantime. We revise quotations, gross tons, as follows: Heavy wrought scrap, $21 to $21.50; cast scrap, $17.25 to $17.50; iron rails, $25 to $26; car wheels, $19; cast borings, $10.50 to $11; wrought turnings, $13.50 to $14; steel rails, $19.50 to $20; steel rails for re-rolling purposes, $25.

COKE.—The coke situation in the Connellsville region is growing much better, and furnace and foundry coke for prompt shipment can be had for $2.50 and $3.10 per ton respectively at the ovens. These prices are on outside coke, however. Connellsville coke for the second half is held at $2.50 for furnace and $3 to $2.25 for foundry. Outside coke is held at about 25 cents per ton lower than these prices. The Connellsville *Courier* estimates the production of the Connellsville region for the week ending March 29 at 219,915 tons. This is the greatest weekly output for the region this year.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
534 MONADNOCK BLOCK, April 8.

Though this market is, of necessity, quiet, owing to the scarcity of material, it is of a very strong disposition. Mills and furnaces, generally speaking, are sold up for period varying from six months to one year on all products, and consumers, by their own necessities, are pushing prices upward, despite the efforts of manufacturers to keep them down to a safe level. There is little pig iron being sold, except for prompt delivery, and so small is the tonnage offered and so great the demand for it, that sellers have no difficulty whatever in getting $20 to $21 a ton for No. 2 Foundry. The demand for plates has taken a sudden impetus, and the local mill has been compelled to refuse orders for over 5,000 tons in the last two weeks. It is accepting no orders of any kind for delivery after July 1, as there is some talk of an advance in this material about that time. Though the buying of bars has subsided from the phenomenal activity in the latter part of March, sales of iron have been fairly large in the past week, the price of 1.95c being firmly maintained. Scrap has returned to its former position of strength, the weakness and prices of last week having entirely disappeared.

PIG IRON.—The situation is quiet, though firm, transactions being limited almost entirely to sales of iron in small lots for prompt delivery. A few producers have some iron left for prompt shipment, but this is being reserved for those customers whose interests sellers feel obliged to look after. Very little inquiry for future delivery is reported, all the large furnaces having withdrawn from the market. Sales of spot iron average about seven to ten cars a day, most of which is from Virginia furnaces. The price of this varies in the different offices, sales of Dayton iron, No. 2 Foundry, having been made at $20.65, Chicago, and Virginia, $19.15. The following quotations approximately represent the market for prompt delivery of material:

Lake Sup. Charcoal	$21 00	to $22 00	Southern Coke No. 4	$17 15	to $18 15
Local Coke Fdy. No. 1	19 00	to 19 50	Southern No. 1 Soft	18 65	to 19 65
Local Coke Fdy. No. 2	18 50	to 19 00	Southern No. 2 Soft	18 15	to 19 15
Local Coke Fdy. No. 3	17 50	to 18 00	Southern Gray Forge	16 90	to 17 90
Local Scotch Fdy. No. 1	19 00	to 19 50	Southern Silveries	17 65	to 18 15
Local Scotch Fdy. No. 2	18 50	to 19 00	Jackson Co. Silveries	19 00	to 19 60
Southern Coke No. 1	18 65	to 19 65	Ohio Strong Softeners	18 50	to 19 00
Southern Coke No. 2	18 15	to 19 15	Alabama Car Wheel	20 50	to 21 00
Southern Coke No. 3	17 65	to 18 65	Malleable Bessemer	19 00	to 19 50

BARS.—As was to be expected, the market is much quieter than for several weeks past. Sales of both iron and steel have been fairly active, however, though most of the material is for late delivery. The prices in effect since April 1 are being firmly maintained. We quote steel, 1.75c, Chicago; iron, 1.95c, Chicago; out of store, 2c to 2.10c; hoops, 2.10c.

SHEETS.—The consumption of both black and galvanized sheets in this territory keeps apace with the output of mills, and the latter is experiencing some little difficulty, owing to the bad railroad facilities, in shipping material on time. We quote No. 27 black, mill shipments, 3.15c to 3.20c; galvanized, 70 and 10 per cent to 70, 10 and 2½ per cent, plus freight. Out of store, No. 27 black, 3.45c to 3.50, and galvanized, 70 per cent to 70 and 2½ per cent.

STRUCTURAL STEEL.—Owing to the condition of mills, there is very little to report about the local market on this material. Practically all the trade is being done through those jobbers who have stocks in their yards. We quote mill shipments, carload lots, as follows: Beams, 15 inches and under, 1.75c; 18 inches and over, 1.85c; structural angles, 3x3 to 6x6, 1.75c; over 6x6, 1.85c; angles, channels and tees, smaller than 3 inches, 1.85c base; plates, 1.75c; lots from store, tees, 3c minimum; beams and channels, 3c minimum with cartage charges.

RAILS AND TRACK SUPPLIES.—While each week brings forward inquiries for standard sections, few sales develop owing to the inability of mills to furnish material in the time required. On light rails the local mill is sold up to July; on spikes to a later period. The demand for the latter material has been so large that the local interest has been compelled to refuse orders for over 5,000 kegs. On other lines of track supplies both local manufacturers are sold up for periods from four to six months. We quote standard sections, $28; light rails, $36 to $38, according to size; out of store, $45 to $50; splice bars, 2c; spikes, 2.30c; track bolts and hexagon nuts, 3.10c to 3.20c; out of store, 3.30c; square nuts, base, 2.85c; out of store, 2.95c.

BILLETS.—One local manufacturer reports having been offered an order for its entire product for a year at $38.20 a ton. A few sales are noted in the past week. We quote Bessemer billets, $38 a ton; open hearth, $40.

MERCHANT STEEL.—One large concern in this field advises us that owing to the heavy buying of the last few weeks, it has been forced to go out of the market until July 1, 1903, on one of its specialties. The buying in other lines of this material by implement manufacturers still continues very active. We quote mill shipments, Chicago delivery, as follows: Smooth finished tire steel, 1.95c to 2c; open-hearth spring steel, 2.45c to 2.60c; sleigh shoe, 1.65c to 1.80c, flat sizes; concave and convex, 2c; out of store, 2.15c; cutter shoe, 2.40c to 2.60c; machinery steel, 2.15c to 2.25c, base; plow steel, 2.50c and upwards, according to quality; toe calk, 2.25c to 2.35c; out of stock, 2.40c to 2.60c; ordinary tool steel, 6c to 7c; specials, 13c and upwards; less than carload lots, 5 per cent to 10 per cent higher; cold rolled shafting, carload lots, 50 per cent off, Chicago; less than carload lots, 45 per cent off, Chicago.

MERCHANT PIPE.—The warm weather has brought forth many orders and inquiries, and notwithstanding the recent heavy buying, the trade continues active. We quote as follows:

MERCHANT PIPE, RANDOM LENGTHS.

	Black Per cent.	Galv. Per cent.
⅛ to ½ in.	56½	44½
¾ to 12 in.	63½	51½

BOILER TUBES.

	Steel Per cent.	Iron Per cent.
1 to 1½ in.	40	35
1¾ to 2½ in.	47½	37½
2¾ to 5 in.	57½	47½
6 in. and larger	45	40

PLATES.—The local interest reports that both new business and specifications are large, the stringency of the market in other materials having stimulated trade to a marked degree. It is refusing orders that call for delivery within 90 days, and in the last two weeks has had to turn down over 5,000 tons. No contracts for delivery after July 1 are being accepted, as

mills expect an advance will be made about that time. We quote as follows, Chicago delivery: Tank steel, base, ¼-inch, 1.80c to 1.85c; flange steel, 1.90c to 2c; marine steel, 1.95c to 2.10c; fire box steel, ordinary, 2c to 2.10c; special, 2.25c and upward. Jobbers are selling from store according to size as follows: Tank steel, 2c to 2.10c; flange steel, 2.25c to 2.35c.

CAST IRON PIPE.—The demand is still active, orders coming in freely from all directions. We quote as follows: 4-inch water pipe, $30, carload lots, f. o. b., Chicago; 6-inch water pipe, $29; 8-inch and larger sizes, $28; gas pipe, $1 a ton higher than above prices.

WIRE AND WIRE NAILS.—There is no diminution in the large volume of business that has been coming in from all parts of the West and Northwest since the first of the year. The local manufacturer reports that it is no longer able to keep up with its orders, and is now about three months behind. We quote as follows: Smooth wire, carload lots, $2.15; painted barb wire, $2.75; galvanized barb wire, in carload lots, $3.05; wire nails, carload lots, $2.20; staples, carload lots, $2.30; jobbers' prices to retailers, 10 cents higher than above for carload lots, and 20 cents for less than carloads.

COKE.—Receipts of coke are increasing gradually, and the outlook is more hopeful than it has been for several weeks. Only half the amount needed is being received, however, and there is still room for much improvement. West Virginia coke sells from $5.50 to $6.00; Connellsville, 25 cents to 50 cents higher.

OLD MATERIAL.—The local market has recovered the position it lost last week, and prices have advanced to their former level and are now much firmer. We quote gross tons, as follows:

Old iron rails	$23 00 to $24 00	Relaying rails	$27 00 to $28 00
Old steel rails, 5 ft. and up	22 50 to 23 00	Old wheels	19 50 to 20 00
Old steel rails, mixed	17 00 to 17 50	Heavy melting steel	17 00 to 17 50
		Mixed country steel	15 00 to 15 50

The following are selling prices per net ton:

No. 1 R. R. wrought	$19 50 to $20 00	Steel axles	$19 00 to $19 50
No. 2 R. R. wrought	17 50 to 18 00	Cast borings	8 50 to 9 00
Dealers' forge	15 50 to 16 00	Wrought turnings	13 00 to 13 50
No. 1 busheling	13 50 to 14 00	Iron axle turnings	14 00 to 14 50
No 1 R.R. & mch.cast	13 50 to 14 00	Steel axle turnings	13 00 to 13 50
Railway Malleable	14 00 to 14 50	Stove plates	11 00 to 11 50
Country malleable	12 50 to 13 00	Old iron splice bars	20 00 to 20 50
Iron axles	26 00 to 27 00		

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, April 9.

Whatever of doubt there may have been regarding the ore rate upon contracts for the coming season of navigation seems to have been dissolved with the announcement made during the week that 1,000,000 tons of United States Steel Corporation ore has been covered at 75 cents. This statement also carries the information that the strong opposition from the Cleveland vessel owners to the lower rate has been broken. The ore that will be moved on contracts has been pretty well covered by this time. The steel corporation fleet will carry 10,000,000 tons, in addition to which outside capacity has been employed for the transportation of 2,200,000 tons. Outside concerns recently took 500,000 tons on the 75c basis in addition to which there will be a certain amount brought down this year upon the five-year contracts recently made. In addition some vessel owners carry over 300,000 tons on last year's contracts. Some of the shippers who made earlier contracts on the 80c basis arranged for the transportation of 4,000,000 tons. Hence contracts have been made for the movement of between 17,500,000 and 18,000,000 tons. Conservative estimates place the total movement for this year at 22,000,000 tons; consequently but little if any more ore will be moved on contracts as the shippers usually leave a portion of their ore to come down wild to provide for possible shrinkages in the demand. The reports this week show that the first cargo of ore has been moved from Escanaba to South Chicago. The first boat from Lake Superior arrived at Cleveland yesterday and cargoes have come from Duluth to Conneaut and Ashtabula. This is the earliest receipt of ore in perhaps 20 years.

PIG IRON.—The coke supply in the Valleys is much improved and production is more nearly up to its normal state than since the beginning of the year. The scarcity of foundry iron has not abated and there is still a considerable call for material which cannot be met. The small amount of iron available for quick shipment is bringing fancy prices and some sales have been recorded as high as $19 in the Valleys for No. 2. The Bessemer association during the week sold upwards of 200,000 tons of Bessemer at $16.50 in the Valleys, $17.25 Pittsburg for delivery during the fourth quarter of this year and the first quarter of 1903. The sale was to the United States Steel Corporation. In this transaction the attitude of the other producers toward the question of price was disregarded and the association acted upon the conservative policy which has governed it since last fall. The slight advance over third quarter prices is understood to have been a concession to certain factors in the Bessemer situation who insisted upon yielding to the tendencies of the market. The quotation on basic iron for fourth quarter delivery is still $17.50 in the Valley, and the available supply is rapidly being sold up. We continue to quote:

Bessemer	$17 75 to $18 75	Scotch No. 1	$18 00 to $19 50
No. 1 Strong F'dry	18 00 to 19 50	Scotch No. 2	17 75 to 18 75
No. 2 Strong F'dry	17 75 to 18 75	Gray forge, Valley	17 50 to 17 75
No. 3 Foundry	17 50 to 18 50	LakeSuperior charc'l	21 00 to 22 00

FINISHED MATERIAL.—The supply of steel in the form of billets and sheet bars is becoming shorter and shorter, and some consumers are feeling the need of material sorely. Producers are not offering any material and quotations depend entirely upon the attitude of the Pittsburg jobbers. The inquiry for structural shapes continues, with most of the business being done out of stock except where it concerns transactions involving deliveries into 1903. The interest in these forward transactions has been increased somewhat with the assurance that the price of raw material is to remain stable during the first quarter of next year. Mill sales are made at 1.70c and store sales range between 2¼ and 3c. The quotation on bar iron is generally 1.80c now, although a 1.70c Pittsburg quotation is still made and takes about all of the business that is going. There are some rumors of coming advances in steel bars to the 1.70c Pittsburg basis, but so far nothing along that line has been done. Bessemer steel bars are selling for 1.60c Pittsburg and open-hearth steel bars for 1.70c Pittsburg. The sheet market has been about on a dead level this week with orders coming in steadily most of the transactions here being out of store. The following prices are quoted on mill sales; No. 24, 2.90c to 3c; No. 26, 3c to 3.10c; No. 27, 3.10c to 3.20c; and the following prices out of stock: No. 10, 2.36c to 2.50c; No. 12, 2.45c to 2.60c; No. 14, 2.55c to 2.70c; No. 16, 2.95c to 3.10c; No. 18, 3c to 3.15c; No. 20, 3.05c to 3.20c; Nos. 22-24, 3.15c to 3.30c; Nos. 22-26, 3.25c to 3.40c; No. 27, 3.35c to 3.50c; No. 28, 3.45c to 3.60c, for one pass cold rolled. For full cold rolled .10c extra is charged.

OLD MATERIAL.—The market is firm at former quotations. A steady business is being done and the market seems not to be influenced to any great extent by the effort to get hold of material to put away pending an advance in prices. We quote for Cleveland delivery, all in gross tons:

Old iron rails	$ 23 00 to 24 00
Old steel rails (6 ft. and over)	20 00 to 22 00
Old steel rails (6 ft. and under)	17 00 to 18 00
Old car wheels	16 00 to 18 00
No. 1 R. R. wrought scrap	21 00 to 22 00
Mill scrap	17 00 to 17 00
No. 1 machine cast scrap	15 00 to 16 00
Iron axles	26 00 to 28 00
Axle turnings	16 00 to 17 00
Wrought turnings (free from cast)	13 50 to 14 00
Cast borings	8 00 to 9 00
Uncut wrought iron boilers	11 00 to 12 00
Steel boiler plates	16 00 to 17 00
Grate bars	11 00 to 12 00
Pipes and flues (clean)	17 00 to 18 00
Tank iron	17 00 to 18 00
Hoop and band iron	13 00 to 14 00
Sheet iron	11 00 to 12 00
Wrought drillings	13 00 to 13 50
Malleable iron	17 00 to 18 00
Stove plate	12 50 to 13 50
Heavy steel	17 00 to 18 00

CINCINNATI.

April 9.

The different branches of the iron trade show practically no change from conditions existing a week ago. The demand for pig iron is not heavy and there is the same disparity between the prices at which different interests are selling iron. The demand for all kinds of finished material, on the other hand, continues very heavy and there is general complaining about the inability to get the material on the ground. The scarcity of pig iron, even in the face of the fact that the demand is not as heavy as it was some months ago, and the premiums at

which it is selling has resulted in a firm market for scrap and advanced prices for some kinds.

PIG IRON.—In spite of the tendency of iron to advance if left to its own way, the large Southern producers have been able to hold the market price for iron at $12 for No. 2 foundry at Birmingham. This they have done even though they have not been selling iron at that price, and No. 2 has been sold by other interests as high as $15 Birmingham.

The position of the large Southern furnace companies was probably made a little plainer this week by their continued refusal to sell iron for delivery beyond the end of the year. A number of inquiries are known to have been made for iron to be delivered after January 1, 1903, but in all cases they have been refused, and in so doing the companies have shown that they consider that the market is already sold far enough ahead. This same opinion is being applied to the sale of iron even for shorter delivery, and the large Southern interests apparently believe that consumers, taken as a whole, have covered their wants for the greater part of the year and they do not want to encourage speculative buying. It is declared by some well posted iron handlers that the large producers will not be in the market until June 1, though they have nothing to base their statements upon save indications. If they are back in the market before that time they will not, so it is said, sell with a very free hand, and the consumer who wants 500 tons will probably have to be contented with 250 tons.

It is significant that during the past week there have been some consumers who have asked that shipment of iron on contract be deferred for the time being. Some interpret this as proving that consumers have bought heavily, and that in some cases it has been shown that they have over bought.

In some quarters it has been intimated that the Southern companies that insist on maintaining $12 as the basis, have been quietly selling through certain channels, and taking advantage of the high prices that are being had for iron. It is a fact that some No. 1 Southern foundry was offered at Indianapolis this week at $19.70 and some No. 2 at the same point at $19.25, all of the make of one of the large companies. This is equivalent to $16 Birmingham for No. 2. On the other hand a case is known where a car of No. 2 Southern foundry was shipped on an old contract calling for $12 Birmingham, to Springfield, O. By a mistake of the clerk the car was routed to Springfield, Ill. The company instructed its Cincinnati agent to sell the iron at Springfield, Ill., rather than have it brought back and offers were had from three consumers who were willing to give $15 for the iron. The offers were wired to the company, but the reply came back that it had been decided that to sell the car of iron at Springfield, Ill., at $15 would be accepting new business, and that the company had said that it was out of the market for the time being, and it would not put itself in the position of accepting any new business. The car was accordingly ordered back to Springfield, O.

Actual sales bringing $14.50 to $15 for No. 2 foundry without any trouble. A large contract was closed this week for iron at $15 for No. 1, $14.50 for No. 2 and $13.50 for No. 4. Charcoal iron has been selling at $22.75 Cincinnati, equivalent to $20 Birmingham. There is still a considerable movement in basic.

It is impossible to quote prices on this market that will give an adequate idea of the stand that has been taken by some of the producers, and at the same time the prices at which iron selling. The following quotations are based on $12 for No. 2 at Birmingham, and only the inside price is given. The prices that are actually ruling for sales may be called premiums, and in about all cases are $2 to $2.50 above the prices given:

Southern Fdy. No. 1	$15 25	Gray Forge	$13 37
" " 2	14 75	Northern Fdy. No. 1	17 85
" " 3	14 25	" " 2	17 55
" " 4	13 75	Southern C. W. iron	20 00
So. Fdy. No. 1 soft	15 25	Malleable coke iron	17 60
So. Fdy. No. 1 soft	14 75		

FINISHED MATERIAL.—The demand for all kinds of finished material keeps up remarkably. Manufacturers are pleading for earlier shipments and all lines are bought generously. Advanced prices have no effect on the demand and there is some wonder expressed by the consumers that the prices have not been advanced on some kinds even farther. The car builders have been especially heavy buyers, taking axles in large contracts and other material as well. The supplies of structural material may be helped out considerably when the building season fully opens up by reason of the fact that a large distributing yard is to be started in Cincinnati. It has been anticipated that iron store interests would advance the price of iron and steel bars out of store to 2.10c on account of the recent advance in bars, but so far there has been no such prices asked. It is understood that there is a fairly good stock of bars in this market. Prices remain 1.92c for bar iron and 1.72c for bar steel. Other material is unchanged.

OLD MATERIAL.—Because of the scarcity of pig iron for immediate or early delivery the scrap market is very firm. Advances are noted in railroad wrought, cast machine and foundry, rails, axles and wheels. Scrap of all kinds is very scarce and it is almost as hard to fill contracts for scrap as for pig. The country seems to be pretty well cleaned up of scrap. A good many of the railroads have sold their scrap or given it in part exchange for new finished material, and all of them are too busy to attend to transporting old rails to market. The following prices rule for scrap at Cincinnati:

Old No 1. Wrought Railroad, net tons	$ 19 00 to 19 25
Cast Machine and Foundry, net tons	13 75 to 14 00
Old Iron Rails, gross tons	24 00 to 24 25
Old Steel Rails, gross tons	24 00 to 24 25
Old Short Lengths, gross tons	17 00 to 17 25
Old Iron Axles, gross tons	23 75 to 24 00
Old Iron Car Wheels, gross tons	18 50 to 19 50
Stove Plates, gross tons	10 50 to 10 75
Wrought Turnings, net tons	13 00 to 14 00
Cast Borings, net tons	7 50 to 8 50

PHILADELPHIA.

April 8.

There is every probability that the second quarter of the year will witness higher values than have so far prevailed. There are relatively few manufacturers who are not behind in deliveries, forming a sort of an endless chain, whose weakest link is pig iron. With the present demand maintained nothing but a larger supply of this material will relieve the situation. Production is expected to reach record-breaking figures for the balance of the year and importations may in a small measure tend to make things easier, yet under the most favorable view consumers appear anxious, lest they will not be able to accept the business offered them. That the United States Steel Corporation has contracted for 300,000 tons of iron for delivery as late as the first quarter of next year has added further strength to the opinion that there is stability in current conditions.

PIG IRON.—Not the least abatement is shown in the scarcity of pig iron. Even regular customers who find themselves short of this material have no easy time in securing sufficient material to keep their works going from day to day, and sellers are spending their time trying to take care of this trade, which is especially urgent in its calls for April and May shipments. As high as $21 is believed to have been paid for No. 2 X foundry to be shipped during this period. Nearly all the furnaces tributary to this market are unable to take any of the business which is being offered for prompt acceptance, and several are scurrying around to obtain enough iron to meet guaranteed deliveries. We quote as follows for Philadelphia and vicinity: No. 1 X foundry, $20.50 to $21.50; No. 2 X foundry, $19.50 to $20.50; No. 2 plain, $18.75 to $19.50; standard gray forge, $18 to $18.50; ordinary gray forge, $17.50 to $18; Basic (chilled), $19 to $19.50.

FINISHED MATERIAL.—A very large demand exists and orders are being refused where the purchaser insists upon deliveries being made in the immediate future. Structural material is only obtainable by paying a heavy premium. The plate mills have all they can do to take care of their regular customers. In bars the mills are behind in deliveries and with advances taking place in raw material it is not unlikely that prices will be raised to meet these. The following are nominal quotations for city and nearby deliveries, though higher quotations would be exacted where time limitations are involved: Plates, ¼-inch and thicker, 1.85c to 1.95c; bars, steel, 1.80c to 1.85c; iron, 1.95c; angles, 1.75c to 1.85c; beams and channels, 1.75c to 1.85c.

OLD MATERIAL.—No substantial changes are in evidence, and while the market is somewhat irregular, prices seems to be holding their own. Bids and offers are about as follows for deliveries buyers' yards: Choice railroad scrap, $24 to $25; ordinary light scrap, $14 to $15; machinery cast, $17 to $17.50; heavy steel scrap, $20.50 to $22; old iron rails, $24 to $26; wrought turnings, $15.50 to $16.50; cast borings, $9.75 to $10.25; old iron axles, $26 to $27; old steel axles, $22.50 to $23; old car wheels, $17.50 to $18.

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ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER

APRIL 10, 1902.

PATENT OFFICE ENCOURAGEMENT OF INVENTORS.

One of our correspondents has had some interest in the recent developments in aeronautics and has favored us in his shop notes with comments upon the progress of inventors in this field. He probably shares the common and fairly well grounded belief that there is nothing in the progress of the art and science of the flying machine to cause any great amount of elation. The unwieldy structures that have so far had the greatest degree of usefulness have been almost wholly confined to the balloon type, and these have shown no great ability to navigate the air. Ascents and descents have certainly been made, and these have had a minimum of accidents in comparison with the limited opportunities each aeronaut, from Montgolfier to Santos-Dumont, has had to practice his venturesome experiments. Strictly speaking, the chances of air navigation with these bulky envelopes are at the mercy of the wind and the attempts, mentioned by our correspondent, at the construction of a practical flying machine are beset by a number of difficulties. Engineers of the standing of Chanute have paid much attention to these problems and the experimenter who deems this study a field but little tilled has a chance to change his opinions and add considerably to his stock of knowledge.

Even if he has stored up a goodly share of the facts at hand in the literature of the subject, he will do well to hold his criticisms thoroughly in hand. If the many have failed to solve the problem, that in itself does not preclude an adequate solution. The important obstacles in the way of a satisfactory answer to many of these riddles are not conclusive in all cases, though it may readily be conceded that the objections founded upon our practical experience can be held as presumptive proof that the query will long await an affirmative answer, not that it is incapable of one.

It behooves the man who has seen so many unexpected achievements during the last quarter of a century, to withhold his verdict until the evidence is in the hands of the jury and we are reminded of this oft desregarded but undoubtedly safe policy by the report of a Patent Office case, which has had the sage judgment of Commissioner Allen during the past month. It seems that an inventor had made application for a patent on an aeroplane, and the examiner could not but look askance at the improvement and the claims. In this frame of mind, he demanded a demonstration of the practical "operativeness" of the device and called for further drawings, etc. This was not enough, and in order that the inventor might be suitably impressed and the device interred beyond hope of resurrection, the examiner says:

> There is no instance in the history of the art of a successful ascent and prolonged flight without the aid of a gas-field. Aside from any other consideration, no claims based upon the present device can be allowed until its operativeness is demonstrated. The most satisfactory means of doing this is a model.

It is nevertheless a difficult task to crush the ordinary inventor and the individual who has grappled with the financial problems incidental to piloting his work into and out of the Patent Office, is not invariably awed by the *ex cathedra* utterance of a Government employee. Our applicant demurred to the opinion of the examiner and cited certain publications to show that successful flight without a gas-field is possible, and furthermore has been accomplished; and the persistent inventor called upon the Patent Office authorities to hear his plaint and asked that the examiner aforesaid take back the judgment. The commissioner in his wisdom was duly impressed with the plea and takes the opportunity to say some encouraging things to inventors. He says that unwelcome statements should be cautiously made to an applicant and enjoins judicial care upon the examining force. A part of the decision proceeds as follows:

> It is the very purpose of invention to do that which had not been done before, and this office cannot consistently allege as a reason for refusing a patent the mere fact that no one heretofore has succeeded in accomplishing the result had in view. This office was created and exists for the sole purpose of encouraging inventors to furnish means to accomplish results which have not before been accomplished. If this applicant's aeroplane is inoperative, it is because of some defect in principle or in mechanical construction and not because no one has been able to make similar devices operative. If the examiner is of the opinion that this device is inoperative, as he appears to be, it is undoubtedly his duty to reject the claims, as was done in this case, and that action is reviewable in the first instance by the examiners-in-chief upon appeal. As a matter of practice, however, this office cannot properly in a case of this kind arbitrarily place upon the applicant the burden of proving that the device is inoperative without stating the reason why it is regarded as inoperative. The assertion of inoperativeness is not a welcome objection and should be made only when supported by a statement of the reasons therefore and not dogmatically. The applicant obviously cannot know what argument to make in his efforts to convince the examiner until he knows what position the examiner takes.

It would be a kindly and courteous procedure if the use of dogmatic and unwelcome assertions were more generally discouraged, particularly when they are directed at so remunerative a class as inventors. The adoption of a violent tirade is rarely so serviceable in the attainment of the desired end as considerate and peaceful persuasion, and it is pleasant to notice the sign of an appreciation of this condition, in these strenuous days, in a Government department so closely connected to the industrial life of the nation as the Patent Office.

Fourth Convention of the National Metal Trades Association.

(Special Telegram.)

CINCINNATI, April 8.—The fourth annual convention of the National Metal Trades Association was called to order in the assembly room of the Grand Hotel, this city, at 10 o'clock this morning by President Geo. F. Steedman, of the Curtis & Co. Mfg. Co., of St. Louis. The registration of the early part of the morning showed nearly 100 members present, besides a number of guests, and this number was increased by later arrivals.

Preceding the convention there had been held on Monday a meeting of the committee on reorganization, E. F. Du Brul, of Cincinnati, secretary, and the administrative council had had a meeting to pass on this report for presentation to the convention.

The report of President Steedman was the first order of business. It emphasized the value of the association's work, commenting on its service to members in the strikes of 1901.

Victor H. Olmstead, commissioner and secretary of the association, who succeeded Henry F. Devens on the latter's resignation in the past year, read his report, which reviewed the work of the organization in the year ending March 31, 1902. It showed that there had been a net increase of 48 members in the year, the present membership being 173. The report showed that on the retirement of Edwin Reynolds as president, Geo. F. Steedman had succeeded to that office; E. C. Lufkin, of the Snow Steam Pump Works, of Buffalo, had become first vice-president, and E. F. Du Brul, of the Miller, Du Brul & Peters Mfg. Co., Cincinnati, second vice-president.

The report of H. N. Covell, of the Lidgerwood Mfg. Co., Brooklyn, as treasurer of the association, was presented and filed. It showed the finances to be in strong and satisfactory condition.

A resolution committee was nominated by the convention, consisting of W. D. Sayle, Cleveland Punch & Shear Works, Cleveland; F. A. Geier, Cincinnati Milling Machine Co., Cincinnati; S. W. Watkins, Christensen Engineering Co., Milwaukee.

An auditing committee was appointed, consisting of E. T. Gilbert, Michigan Bolt & Nut Works, Detroit, Mich.; C. F. Wieland, Kempsmith Mfg. Co., Milwaukee; and J. J. Walser, Goss Printing Press Co., Chicago.

The next order of business was reports by chairmen of the several district committees concerning the work of the association in their respective districts and existing labor conditions therein. Much information was brought out also in informal statements from representatives of various districts, as to hours, wage rates, apprenticeship, handy men, etc. The reports of the district chairmen went into the conduct of the strike in 1901 with some minuteness. It was shown that in every instance in which the employers in a given city had stood together, taking no step as individuals, and as a unit had handled the questions involved, the strikes had been broken. Reports with special detail were given from Cincinnati, Chicago, Cleveland, Milwaukee, Minneapolis and St. Paul. The organization of the Cincinnati Metal Trades Association and its plan of handling the local strike came in for detailed consideration, and the methods of the Cincinnati employers commended themselves to the association for their wisdom and effectiveness. The history of the Cincinnati strike as detailed to the convention became an impressive object lesson in cooperative effort by manufacturers of machinery.

At the afternoon session the convention listened to further reports from the various districts as to the conduct of the strikes of 1901, Denver, San Francisco and Cleveland in particular. This was followed by the report of the Finance and Strike Committee, in charge of the strike in 1901, so far as the organization as such was involved in it.

A Banquet with a Shop Program.

A thoroughly enjoyable and profitable feature of the convention was the banquet given the members and guests of the National Metal Trades Association by the Cincinnati Metal Trades Association at the St. Nicholas Hotel on Tuesday evening. The function in all its appointments ranked the best that has been attempted at any association gathering, and had the not common feature of mingling with the delights of music, flowers, and menu, a program of instruction. The toast master was Philip C. Fosdick, of the Fosdick & Holloway Machine Tool Co., Cincinnati, whose introductions were felicitous and well seasoned. Mr. Fosdick first presented Mayor Julius Fleischmann, of Cincinnati, who gave the guests a welcome to the city. The announced topics were then taken up.

F. A. Halsey, of New York, read a paper on the premium system of remunerating shop labor—a system with which his name is familiarly connected as its author. Following the paper came some expressions from Cincinnati machinery manufacturers who had had experience with the plan in the past year or two.

The topic "Gang Bosses" was discussed by Wm. Lodge, of the Lodge & Shipley Machine Tool Co., Cincinnati, the speaker giving some details of a system of shop management with more than the usual number of foremen and with a finer subdivision of supervision.

Those in Attendance.

The following is a list of the members and guests at the convention:

MEMBERS.

Geo. F. Steedman, Curtis Co. Mfg. Co., St. Louis, Mo.; E. C. Lufkin, Snow Steam Pump Works, Buffalo, N. Y.; E. F. DuBrul, Miller, DuBrul & Peters Mfg. Co., Cincinnati; H. N. Covell, Lidgerwood Mfg. Co., Brooklyn, N. Y.; Victor H. Olmstead, N. M. T. A., New York; E. J. Mercer, N. M. T. A., New York; Walter Laidlaw, Laidlaw-Dunn-Gordon Co., Cincinnati; James C. Hobart, Triumph Electric Co., Cincinnati; H. M. Norris, Bickford Drill and Tool Co., Cincinnati; Robt. B. McGowan, John McGowan Co., Cincinnati; Wm. Lodge, Lodge & Shipley Machine Tool Co., Cincinnati; Fred A. Geier, Cincinnati Milling Machine Co., Cincinnati; S. P. Egan, J. A. Fay & Egan Co., Cincinnati; J. H. Day, J. H. Day Co., Cincinnati; Henry Korb, Greaves & Klussman, Cincinnati; Wm. Greaves, Greaves & Klussman, Cincinnati; Wm. N. Hobart, Triumph Electric Co., Cincinnati; H. C. Hoefinghoff, Bickford Drill & Tool Co., Cincinnati; J. Kirby, Jr., Dayton Mfg. Co., Dayton, O.; M. H. Barker, American Tool & Machine Co., Boston; L. E. Thomas, Lloyd Booth Co., Youngstown, O.; M. A. Neeland, Wm. Tod Co., Youngstown, O.; E. D. Church, Jackson & Church Co.; D. J. Kilby, Kilby Mfg. Co., Cleveland; D. G. Moore, Samuel L. Moore & Sons Co., Elizabeth, N. J.; Fred F. Stockwell, Barbour-Stockwell Co., Cambridge, Mass.; Henry F. Arnold, American Tool & Machine Co., Boston; P. B. Kendig, Seneca Falls Mfg. Co., Seneca Falls, N. Y.; Thos. Livingston, Wm. R. Perrin Co., Chicago; N. B. Payne, Payne Co., Elmira, N. Y.; W. D. Sayle, Cleveland Punch & Shear Co., Cleveland; John S. Lewis, Wm. Tod Co., Youngstown, O.; E. T. Gilbert, Michigan Bolt & Nut Works, Detroit, Mich.; Theo. P. Byram & Co., Inc., Detroit, Mich.; W. P. Egan, Fred W. Wolf Co., Chicago; Exile Burkitt, Southern Engine & Boiler Works, Jackson, Tenn.; W. A. Evans, Commercial Electric Co., Indianapolis, Ind.; C. F. Wieland, Kempsmith Mfg. Co., Milwaukee, Wis.; Thos. E. Durban, Erie City Iron Works, Erie, Pa.; Geo. M. Jackson, Springfield Mfg. Co., Bridgeport, Ct.; Benj. Sebastian, Sebastion Lathe Co., Cincinnati; F. H. Strong, Eaton, Cole & Burnham Co., Bridgeport, Ct.; Jacob May, Sebastian Lathe Co.; Cincinnati; E. H. Bullard, Bullard Machine Tool Co., Bridgeport, Ct.; T. J. Neacey, Filer & Stowell Co., Milwaukee, Wis.; Sam'l L. Moyer, Lunkenheimer Co., Cincinnati; S. L. Hadley, Commercial Electric Co., Indianapolis, Ind.; J. J. Walser, Goss Printing Press Co., Chicago; E. E. Greenwald, I. & E. Greenwald Co., Cincinnati; H. G. Fieber, Medart Patent Pulley Co., St. Louis, Mo.; O. B. Kinnard, Kinnard-Haines Co., Minneapolis, Minn.; Alex. Adams, Twin City Iron Works, Minneapolis, Minn.; Oliver Crosby, Moore Carving Machine Co., Minneapolis, Minn.; Geo. W. Krapp, American Fire Engine Co., Cincinnati; E. J. Kimball, Globe Iron Works, Minneapolis, Minn.; Frederick K. Copeland, Sullivan Machinery Co., Chicago; H. E. Goodman, Goodman Mfg. Co., Chicago; James Weir, Weir & Craig Co., Chicago; P. K. Morcom, Colorado Iron Works Co., Denver, Col.; S. W. Watkins, Christensen Engineering Co., Milwaukee; H. F. Devens, National Cash Register Co., Dayton, O.; Enoch Earle, P. Blaisdell Co., Worcester, Mass.; R. H. Jeffrey, Jeffrey Mfg. Co., Columbus, O.;

J. W. Gardner, Gardner Governor Co., Quincy, Ill.; Howard P. Eells, Bucyrus Co., So. Milwaukee, Wis.; William H. Speer, Jr., Dayton Mfg. Co., Dayton, O.; J. H. Whiting, Whiting Foundry Equipment Co., Harvey, Ill.; F. D. Wanning, Birmingham Iron Foundry Co., Derby, Conn.; F. W. Boye, Jr., Schumacher & Boye, Cincinnati; Samuel J. Watson, Watson Machine Co., Patterson, N. J.; E. A. Schumacher, Schumacher & Boye, Cincinnati; A. C. Pessano, Geo. V. Cresson Co., Philadelphia; J. A. Seymour, McIntosh-Seymour Co., Auburn, N. Y.; F. H. Stillman, Watson-Stillman Co., New York; M. D. Knowlton, Knowlton & Beach Co., Rochester, N. Y.; H. F. Frohman, Whiting Foundry Equipment Co., Cincinnati; G. A. Mayer, Cincinnati Milling Machine Co., Cincinnati; David C. Jones, Lunkenheimer Co., Cincinnati; Napoleon DuBrul, Miller, DuBrul & Peters Co., Cincinnati; Fred Holz, Cincinnati Milling Machine Co., Cincinnati; H. Ritter, Lunkenheimer Co., Cincinnati.

GUESTS.

F. A. Halsey, *American Machinist*, New York; John W. Neil, John H. McGowan Co., Cincinnati; James M. Curran, James H. Curran Elevator Co., Cincinnati; Daniel Huguenin, Chicago Metal Trades Association, Chicago; James H. Curran Elevator Co., Cincinnati; Geo. W. Cope, the *Iron Age*, Chicago, Ill.; A. I. Findley, *The Iron Trade Review*, Cleveland; A. C. Marshall, Employers' Assocation, Dayton, O.; H. M. Lane, Lane & Bodley Co., Cincinnati; E. H. Hargrave, Cincinnati Tool Co., Norwood, O.; W. R. Wallis, *American Machinist*, New York; Alfred Marshall, Marshall & Huschart Machine Co., Chicago; Geo. W. Otting, John Steptoe & Co., Cincinnati; H. M. Moore, Cincinnati Punch & Shear Co., Cincinnati; John A. Penton, Detroit, Mich.; Geo. F. Stewart, Bradford Machine Tool Co., Cincinnati; W. T. S. Johnson, Bradford Machine Tool Co., Cincinnati; Philip Fosdick, Fosdick & Holloway Machine Tool Co., Cincinnati; W. S. Norris, Lane & Bodley, Cincinnati; P. G. March, Cincinnati Shaper Co., Cincinnati; B. B. Quillan, Cincinnati Planer Co., Cincinnati; W. H. Burtner, Cincinnati Planer Co., Cincinnati; Chas. F. Dolle, National Machine Tool Co., Cincinnati; A. H. Tuechter, Cincinnati Machine Tool Co., Cincinnati; S. C. Schauer, Cincinnati Machine Tool Co., Cincinnati; H. Belmer, Belmer-Eames Tool Co., Cincinnati; W. B. Bogardus, National Portland Cement Co., Toronto, Ont.

The Cincinnati Manufacturers.

The work of the local committee in providing for the entertainment of the delegates gave an impression of the executive ability of the Cincinnati machinery manufacturers, which well bore out the reputation they had gained in their handling of the labor troubles of 1901. That the local association is in a flourishing condition was attested by the report presented by its president, Walter Laidlaw, of the Laidlaw-Dunn-Gordon Co. The entertainment committee, consisting of J. C. Hobart, H. M. Norris, R. K. LeBlond, Robt. McGowan, Wm. Lodge, F. A. Geier, C. H. M. Atkins, Si. P. Egan and J. H. Day, was constant in its attentions, and the banquet of this evening made a fresh contribution to Cincinnati's reputation as an open-hearted entertainer of conventions.

A number of the delegates made visits to Cincinnati machine tool shops today; others will stay over until Thursday for this purpose. No less than 46 establishments, manufacturing machinery in the limits of the city, were thrown open to visitors, and six in the suburbs gave like invitations. These were classified in a printed list, according to the districts in which they were located, and visitors access to them was thus facilitated. The district groupings were: East End, Central District, Bottoms District, West End, Brighton District, Suburbs.

Wednesday's Program

For Wednesday's sessions of the convention the program included the discussion of two topics of association work that were left untouched on Tuesday. Following this the report of the reorganization committee is to be taken up, with discussion of the new constitution and by-laws. The afternoon session was to be given up to new business, an evening session at 7 o'clock to the report of the nominating committee and the election of officers, followed by a smoker tendered by the Cincinnati Metal Trades Association.

Walter L. Clark, vice president of the Niles-Bement-Pond Co., sails for Europe this week.

NEW FOUNDRY IRON FURNACES.

Since the first of the year a number of new blast furnace projects have been promoted and two new furnace companies are being organized, one at Detroit, Mich., and the other at Canton, O. We have already referred to the foundry iron furnace to be built at Toledo and to another at South Chicago. At Detroit the furnace is to be located on Zug Island and the coke produced in Semet-Solvay ovens of the Solvay Process Co. is to be used in this furnace. The product will be foundry iron and the daily output will be about 350 tons. There is an extensive Cleveland interest connected with this project. At Canton, O., the foundrymen are also organizing a company for the erection of a furnace to produce foundry iron. This project is still in its incipient stage, although considerable stock has already been subscribed. This project should not be confounded with the Bessemer furnace project talked of and already put under way by the Carnahan Tin Plate Co. and allied interests. With the projects mentioned and that under way at Dubois, Pa., the foundry iron output promises to be considerably increased within the next 18 months.

Probable Advance in Shafting.

(Special Telegram.)

PITTSBURG, April 9.—A meeting of the National Association of Shafting Makers of America is being held here today for the purpose of discussing trade conditions. The present discounts on shafting are 50 and 15 and it is probable that prices will be advanced to 45 and 40. Since the association was formed a number of advances have been made due in a great measure to the advancing price of raw material.

Negaunee Mine Leased by Cleveland-Cliffs Iron Co.

One of the most important of recent transactions in Lake Superior iron mining property was the acquisition by the Cleveland-Cliffs Iron Co. of the lease of the Negaunee mine at Negaunee, Mich. The mine is now a United States Steel Corporation propery, and the present lease will not expire until well along in 1903. The principal fee owner is Geo. Lonstorf, of Milwaukee, who is reported to hold 26-27ths. The lease is for 25 years and the bonus paid is stated to be $1,500,000. The royalty is 30 cents and the minimum output is 300,000 tons. With the Negaunee mine and the new Maas, at which a shaft is now going down, each of these properties being capable of about 300,000 tons a year, the Cleveland-Cliffs Iron Co. will have an annual output of above 2,000,000 tons of ore. This last transaction emphasizes its importance as the leading producer of ore apart from the United States Steel Corporation, and all its properties are on the old ranges.

The recent break-down of the rod mill of Jones & Laughlins, Ltd., South Side, Pittsburg, is more severe than at first anticipated and from present indications repairs cannot be made for three months at least. All the orders for rods on the company's books aggregating nearly 20,000 tons have been turned over to the American Steel & Wire Co., the steel to be furnished by Jones & Laughlins, Ltd.

At Coraopolis, Pa., the Duquesne Steel Foundry Co. is extending its plant by an addition to its main building 100 feet long and 120 feet wide. This plant and that of the Lewis Foundry & Machine Co. are now being operated double turn.

The new 26-inch billet mill at the Bessemer plant of the Republic Iron & Steel Co., Youngstown, O., was placed in operation this week. P. J. Gordon has been appointed superintenedent of the mill. Operations thus far have been highly satisfactory. The mill is being operated one turn only.

Louis F. Fieser and Linn Bentley, of Columbus, O., announce that they have purchased the interest of the late Mr. Wagoner in their business and that it will be conducted under the firm name of Fieser & Bentley.

The Erie Pump & Engine Co., of Erie, Pa., recently shipped a carload of pumps to the Philippine Islands, and will ship a carload to Yucatan this week.

APPARATUS FOR FEEDING BLAST FURNACES.

Albrecht B. Neumann, chief draftsman at the Joliet works of the Illinois Steel Co., has recently patented a mechanism for feeding blast furnaces which is illustrated in the accompanying engravings. The change from the method in use at these works prior to the adoption of Mr. Neumann's invention has proved most economical. Taken on the basis of one horse-power at a cost of 1½ cents per hour, it has been computed that the expense necessary to operate the bells by steam on one furnace is about $2,000 per year as compared with $22 with an electric motor on the Neumann system. The purpose of the inventor was the construction of a mechanism by which the feeding bells will be operated to have one bell held closed as the other is opened and to have the operation positive and reliable with a mechanism at once simple and easy to operate. A number of similar devices have been brought out in recent years in connection with automatic top-filling apparatus.

The engraving shown in Fig. 1 is an elevation of the upper end or top of a blast furnace with the feeding tower, the upper end of the furnace, the receivers and dropping bells for the charge being in section.

The receiving end of the blast furnace A is shown with the outlet for gas and necessary openings for the explosion door B. The lower final discharging or dropping bell C is of

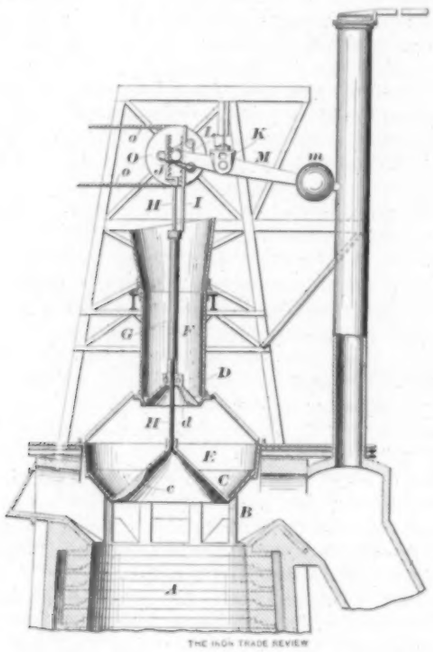


FIG. 1.—A NEW METHOD OF FEEDING BLAST FURNACES.

the usual construction, with the exception that on one side it is thickened so as to form a bulge or rise, and thus give an increased weight on that side to maintain the center of gravity directly in line with the support in opening and closing the bell. The initial or upper discharging or dropping bell D is also of the usual construction except that on one side it is thickened at d to give an excess of weight on that side to maintain the center of gravity under the support in opening and closing the bell. The bell C closes the discharge or mouth of a receiving chamber E, entered in the head of the furnace, and the bell D closes the outlet of a receiver or hopper F into which the charge is deposited in any usual and well known manner, the upper end of the hopper F being of an increased size or widened out and higher on one side than on the other, as usual.

The upper bell is carried by a hollow rod G which has the lower end introduced into the neck of the bell and secured by keys or any other fastening. The lower bell is supported by a rod H which passes up through the hollow rod G with its upper end projecting above the end of the rod G the distance required. The upper end of the rod G is secured to a bar I, having on its inner face a rack, and on the end of the rod H is a similar rack J. The racks I and J stand opposite each other with the teeth on the inner sides and separated a sufficient distance to receive between them a gear wheel in mesh with both racks. The racks lie between two plates which form a guide-head L and this in turn carries rollers which engage with the rear faces of both racks and maintain the rack bars in a vertical line of travel and at the same distance apart.

The guide-head L is pivotally mounted on the shaft which is supported by the forked inner end of a balanced lever M. The opposite or outer end of the lever M carries an adjustable weight m which can be set properly so as to balance the charge and the weight of the bells, and this weight operates through the lever to return a bell after the charge has been dumped or deposited either into the receiving chamber from the receiver or dropper or into the furnace from the receiving chamber. The lever is mounted on a pivot and suspended from an overhead beam by bolts. The gear operating the racks I and J is fastened to a pulley O driven by a cord or belt o which may be operated from an electric or other motor.

The charge after being deposited in the receiver or hopper F is to be emptied into the chamber E, and for this purpose the bell D is to be opened and the bell C is to be kept closed.

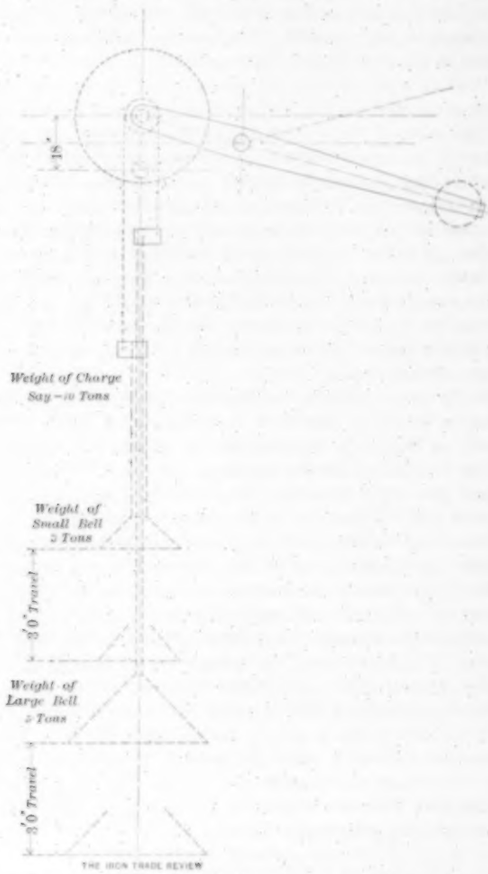


FIG. 2.—DIAGRAM OF NEUMANN METHOD FEEDING FURNACES.

The upper bell D is opened by forcing down the carrying tube G by the action of the pulley O and the gear forcing down the rack bar I and moving the bell away from the mouth of the hopper and at the same time having an upward pull on the rack J by which the lower or inner bell will be tightly held against the discharge mouth of the receiving chamber. The gear is in effect held between the two racks, and the downward movement of the rack bar I combined with the upward pull on the rack bar J which is held fixed, operates to travel the gear downward on the rack J carrying with it the head L and turning the lever M on its pivot to raise the weighted end of the lever, with the result that the distance of movement for the gear is divided between the two racks and the weighted end of the lever is only raised half as much as it would be if the gear traveled solely on the rack which is being depressed, thus saving in the distance traveled and in the time required to open the bell. The charge in the hopper is discharged with the opening of the mouth of the receiver by the forcing away of the controlling bell and with the discharge

of the contents of the receiver or hopper the weight, which before acted as an equalizer, has the balance of power and operates to at once return the parts to normal position, closing the bell of the hopper F and carrying the rack bar J and the gear to the normal position.

The discharge of the material into the furnace is accomplished by a reversal of the movement of the pulley O and the cord o. The lower bell being opened by a downward movement of the carrying rod H and by means of the same movement of the driving gear as in the previous operation, the distance traveled by the gear is divided between the two racks and the supporting lever is only moved through a half throw. It will be seen that in opening the upper bell, the lower bell is held tightly closed by reason of the upward pull of the gear on the rack bar J, and that in opening the lower bell, the upper bell is held tightly closed by reason of the upward pull of the gear on the rack bar I, thus ensuring the maintenance of either bell tightly closed with the opening of the other bell during the operation of depositing a charge from the hopper into the furnace.

The essential feature of the invention is a quick, positive and reliable mechanism for opening and closing the bell and other than the rack and gear can be utilized for the purpose. The inventor, for example, illustrates sprocket and chain connection in place of the gear and racks.

It will be noted that in the operation of the mechanism the pressure exerted on the rack bars or on the sprocket chains is at one side of the central line of the carrying rods and the bell, with the result that the center of gravity would be misplaced so that the bell in making its movements would swing or tip to one side and would not open or close in a direct line and this would interfere with the closing of the bells tightly. It is for the purpose of obviating this objection that the bulge or rise is provided on each bell, the bulge being on the opposite side of the bell to that of the moving device, overcoming the tendency of the moving device of the rod to overweight the bell on that side and tip it to one side out of a true vertical line.

Mr. Neumann submits the diagram shown in Fig. 2 with the following figures: (10 tons + 5 tons + 3 tons) × 2,000 pounds × 1½ feet × 2 = 208,000 feet pounds per charge. Assuming 75 charges in the 24 hours, we have 75×365=27.375 charges per year or 108,000×27,375=2,956,500,00 feet pounds per year. One horsepower being 33,000 feet pounds per minute and assuming the cost per horsepower each hour to be one cent, we have 33,000×66=1,980,000 feet pounds at a cost of one cent. Adding 50 per cent to the theoretical work done we have 2,956,500,000+50 per cent = 4,434,750,000 feet pounds and the cost 4,434,750,000÷1,980,000=2,290 cents or $22.90 in one year. This calculation is based upon the actual cost of electric power at the Joliet plant. The size of motor required will be ascertained as follows: assuming that it takes two minutes to dump one charge of which one minute is for dropping the bells and one minute for returning, then (10 tons + 5 tons + 3 tons) = 2,000×3=108,000 feet pounds per minute. Add 50 per cent for friction and we have 162,000 ft. lbs. per minute or 162,000÷33,000=about a 5-horsepower motor.

The employes of the Titusville Iron Co., Titusville, Pa., each of whom recently received a bonus of 5 per cent of the wages earned in 1901, passed a resolution of thanks to the board of directors "for their substantial appreciation of our efforts in the past; and we pledge ourselves to further efforts in the future in support of our superintendent and the management."

The Oklahoma coke plant, located south of Graceton, Pa., in the Connellsville region, has been purchased from Harry McCreary by Joseph Wharton of Philadelphia, Pa., for a consideration of $400,000. The original plant comprised 24 ovens, 250 acres of surface, and coal under 250 acres. Since Mr. McCreary came into possession of the property he purchased 2,126 acres of land adjoining this property and this was included in the sale. It is the intention of the new purchaser to expend $100,000 in enlarging the plant. The plans include the erection of 126 ovens, so that the plant will contain 150 ovens. In addition a washer and water works are also to be installed.

PERSONAL.

Prof. C. H. Benjamin, supervising engineer of smoke for the city of Cleveland, will speak at the hearing on the bill for the abatement of smoke at the Massachusetts State House, Boston, April 10. On the evening of that day Prof. Benjamin will deliver an address on "Smoke and Its Abatement in Large Cities," in the Walker building, Massachusetts Institute of Technology.

J. D. Hurley, formerly vice-president and general manager of the Standard Pneumatic Tool Co., has been appointed manager of the Chicago Pneumatic Tool Co., with headquarters at Chicago.

Andrew Carnegie will sail for Europe in the last week of April. He will be present at the dedication of the Carnegie Library at Carnegie, Pa., on April 22, and the same week will be in Pittsburg to confer with the commission which has in hand the building of the proposed Carnegie technical school in Pittsburg. The site will probably be selected and the plans approved before Mr. Carnegie's departure for Europe.

J. C. Whitridge, for six years one of the associate editors of the *Railroad Gazette*, in charge of the editorial office at Chicago, has accepted the position of assistant to General Manager Bush, of the Buckeye Malleable Iron & Coupler Co., Columbus, O.

The committee of the American Society of Civil Engineers, to consider the advisability of modifying the society's standard rail sections, has been named as follows: L. F. G. Bouscaren, consulting engineer, Cincinnati, chairman; C. W. Buckholz, chief engineer Erie Railroad, New York; S. M. Felton, president Chicago & Alton Ry., Chicago; Robert W. Hunt, consulting and inspecting engineer, Chicago; J. D. Isaacs, assistant engineer of maintenance of way, Southern Pacific Co., San Francisco, Cal.; Richard Montford, chief engineer, Louisville & Nashville R. R., Louisville, Ky.; H. G. Prout, editor *Railroad Gazette*, New York; J. T. Richards, engineer maintenance of way, Pennsylvania R. R., Philadelphia, Pa.; Percival Roberts, Jr., American Bridge Co., New York; G. E. Thackeray, structural engineer, Cambria Steel Co., Johnstown, Pa.; E. K. Turner, consulting engineer, Boston; Wm. R. Webster, consulting and inspecting engineer, Philadelphia.

William Wade, who for many years was secretary of the Mackintosh-Hemphill Co., of Pittsburg, retired last week from active participation in the affairs of the company. William Westerman, who for three years was his assistant, has been elected his successor.

Alfred C. Berry, a consulting engineer of Glasgow, Scotland, was in Pittsburg last week. He represents a Cape Colony Railroad and came to Pittsburg for the purpose of inspecting fourteen locomotives under construction at the Pittsburg plant of the American Locomotive Co.

Mr. John J. Shannon, who for many years was superintendent of the Ensley furnaces of the Tennessee Coal, Iron & Railroad Co., has resigned to accept a position with the Alabama Steel & Wire Co.

Although it is reported that E. O. Hopkins will resign the presidency of the Sloss-Sheffield Steel & Iron Co., it is is denied by Mr. Hopkins. Gentry Hillman, manager of the Birmingham furnaces of the company, resigned on April 1, as well as C. H. Schoolar, the auditor of the company.

Charles M. Schwab, president of the United States Steel Corporation, has increased his donation to the St. Thomas' Roman Catholic congregation at Braddock, Pa., from $50,000 to $70,000. The money will be used in the erection of a new church.

Fred J. Williams, vice-president of the Seventh District of the Amalgamated Association, has resigned. He has been succeeded by M. E. Winns of Gate City, Ala.

The will of the late Aaron French, of Pittsburg, Pa., disposes of property to the value of about $500,000.

E. H. Williams, of Sharon, Pa., has been placed in charge of the entire blast furnace department of Pickands, Mather & Co., of Cleveland, O. Heretofore he has had charge of the Sharpsville and West Middlesex furnaces of the company. He will now also be in charge of the furnace construction at Toledo, O.

The Otis Elevator Co. has raised its employes' wages 5 per cent, both at the Yonkers and Chicago works. This advance was given unsolicited.

The Elimination of Blast Furnace Variables.

BY F. L. GRAMMER.

To treat this subject properly would require a volume, which we hope soon may be written by those qualified who have the time to give to it. In view of the fact that the modern literature on blast furnaces is scattered and what has been assembled is woefully out of date, a few views obtained from a broad experience may be of interest for their suggestiveness if not wholly accepted as conclusive. Space forbids quoting all the data from which the conclusions are drawn.

By many, even in these days, blast furnace management is considered without the pale of reason: a view which originated from reduction being a hidden process and because of the cyclic nature of its operation. It seems to be an aggregation of variables, and its study and management may be aptly compared with the solution of higher equations of many variables. We are taught that such problems are frequently impossible of solution even by great mathematicians, save approximately.

The subject, therefore, seems to demand either the introduction of men of broader caliber or that these variables be made constants and known terms. One thing was clearly established in the minds of past owners and managers and that is, that the furnace was liable to get into frequent and severe troubles. So in selecting men for active charge, vitality and persistency were the most sought virtues. Where the conditions are as they were 20 years ago this requirement holds today.

This view of reducing unknowns and variables to knowns and constants is applicable to the development of most sciences and truths. At least 18 influences and facts contribute to the making of a "climate" and the subjects of time and tide confront us with a number of complex varying influences. Yet it would seem by general verdict that, possibly excepting the broad field of biology (a pure concrete science), in no sphere of investigation can we find such complex interdependent conditions as are found in blast furnace operations. Other sciences and branch sciences exhibit complexities superimposed—not intertwined—interdependent.

Passing with simple mention the early important strides in blast furnacing, such as raising the height from 40 to 75 feet; the introduction of coke as a fuel, the substitution of hot blast for cold blast, the utilization of blast furnace gas as a fuel, the mechanical devices—we wish to consider the later steps which may be comprehended under our title and which were made in the past 16 or 18 years.

As an instance of growth in knowledge, it is now amusing to us to see abandoned plants with boilers placed up in the air near the furnace top, because they did not see how the gas could be brought down from the furnace top to the boilers.

If a workman is known by his tools no less is the development of an industry measured by the perfection and number of its indices and gauges and reports. As the whole science of modern chemistry owes its existence to the chemical balance whose possibilities were so properly and promptly appreciated by Lavoisier, and as astronomy owes its later development to the telescope, spectroscope and camera, so blast furnacing in the past dozen years owes its development to the lessons of the laboratory, the pressure and temperature recorders.

Well informed superintendents who are allowed to control can now predict results with as great accuracy as Mendeleff foretold the discovery and attributes of several later isolated chemical elements and as the astronomer Vogel, by means of his spectroscopic knowledge, discovered the binary to the star Algol. We are told that at the battle of Ping Yang the Chinese found the best Krupp guns of no avail. So here, unless the moral force and intelligence are behind the facts and data they are useless. There are few plants even now where the manufacture is a regular predetermined process. At many the unknowns and variables are as they were 12 years ago—which may be enumerated roughly as follows:

Ores, in silica, sulphur, alumina, titanium, bases, arsnic, iron, lead, phosphorus, combined water, size of lumps, chemical occurrence or union, moisture.

Limestone, in acids, lime, magnesia, phosphorus, size, cleanliness, fracture.

Fuel varied in ash, fixed carbon, size, sulphur, phosphorus, structure, strength.

Air varied in volume (many causes), temperature, moisture, method of introduction, pressure.

Dimensions and equipment varied by caprice and frequently without regard to other dimensions, the nature of ore and stock or the equipment available.

Management.—The laws of the process being imperfectly understood, the moves made were frequently wrong and many loafers were as successful as those who earnestly worked.

A chaotic layout, certainly, and made worse by the varying conchoidal and cubical structure of anthracite fuel. The results obtain reflected the crudity of knowledge—high and low sulphur, high and low silicon; even the manganese and phosphorus variations succeeding each other with misunderstood and unexpected intermittency. While strong coke was an all-important advance over anthracite, the chief modern solver of the problem was Nature herself, by giving the American manufacturers Lake ores. These ores are found in large quantities of constant composition with the objectionable impurities of sulphur and titanium forgotten and phosphorus so low as to be admirably adapted to Bessemer requirements. The large extent of the deposit of certain grades probably suggested using fewer ores in the burden and so each ore could be better studied.

Lake ores being regular and Connelsville coke being regular, constancy in chemical composition of iron was approximated, and regularity being appreciated uniform limestones were sought for flux. It being now possible more frequently to predict results, slag analyses and pig analyses were made more frequently to determine more advisable chemical relations and to study the effect of moves made. Large lumps unsmelted being occasionally seen in front of tuyeres suggested the breaking of ore and stone into small lumps. This is now carried out to better advantage at the mines.

The chemical relations being intimately associated with thermal were not and are not properly appreciated in many instances. In touching on the silica and alumina in slag an illustration is afforded of what is meant by mutually dependent variables. On Lake ores an average of a half ton slag is made to each ton of metal. Silicon weighs roughly half as much as silica; so an increase of 1 per cent silicon in metal means a decrease of 4 per cent silica in slag and vice versa. A 4 per cent variation of silica in slag affects its fluidity, fusibility and basicity and sulphur absorbing powers. When a furnace "hangs" or meets an unexpected lean streak of ore, the excess of heat in the crucible raises the silicon in the metal and decreases the silica in the slag, causing the old furnacemen to fear the furnace was going to "lime set," so they piled in more wind or cold wind to cool it off. They used variable wind to counteract variable ores and coke. Sometimes they incorrectly took off limestone.

Variations in volume of wind too frequently occur unavoidably in plants backed up by antiquated boilers and engines. These variations and purposed changes along with irregularities in size and composition of stock altered the zones or regions of greatest heat in the furnace, interfering with the region where the lime and silica united. It is in furnaces which experience such treatment that scaffolds are found.

By means of counters, indicators, recorders and pressure gauges and records kept, the variations in wind were studied and furnacemen were impressed with the fact that they were not getting the constant wind they thought or even what was ordered. They found they did not get a full tub full of air at a stroke, and that leather valves and springs gave poor results late in the campaign, not to mention their inadequacy under high pressures. As a result of this education we obtain positive acting inlet and outlet air valves, reducing another variable and unknown to a constant, or nearly so. As an example, I have known plants to register over 100 cubic feet of wind, piston displacement, per pound of fuel burnt, when with the same fuel and level above sea a modern engine and tight connections registers 55.

The breaking up of ore and stone into small lumps, say what would pass through a 4-inch screen—exhibited the inadequacy of the blast furnace gas to furnish the proper power to meet augmented pressure of blast without using extra coke in the furnace; and the desire to save coke led to the steam economies of compounding and condensing engines, water tube

boilers, heaters and more economical pumps. Tod, Southwark, Allis and others met the engine problem and the Cahall, Babcock, Stirling and others met the boiler demand. These changes came in opportunely with the discovery of Mesabi ore, which if not absolutely demanding economical engines on small furnaces finds them a *sine qua non* in furnaces over 85 feet in height. The cubic feet of wind per pound of coke burnt becomes a very instructive figure, suggesting as it does leaks, poor engines, dirty walls of furnace and poor coke.

While I fear I have made only too apparent the complexity of relations, I will cite one more variously viewed fact, showing how few statements can be made unqualifiedly. Alumina beyond certain percentages renders the slag infusible and pasty, preventing regular movement of stock. Some have put 12 per cent as the interfering limit, and many dilute the alumina by adding silicious material when the ores and fuel would give a higher per cent. With old plants and equipment unable to work against the high pressures of pasty slag this is not a bad procedure. It is also advisable frequently to decrease the alumina with sulphurous ores. With a strong equipment I have seen furnaces run on a 14 per cent alumina slag producing more iron on lower fuel consumption than if they had considered 12 per cent the limit. The question as to whether the heat required to melt a smaller volume of highly aluminous infusible slag is greater than for a larger volume of less aluminous, more fusible slag, is interesting. Mr. Ackerman, of Sweden, has done much work along this line.

Now, having constant and known stock and wind and indices necessary to maintain an output of regular quality, the furnace as a heat engine was worked closer to its limit, resulting in lower silicons, for silicon in many respects is a thermometer of crucible heats. The introduction of pyrometers, not affected by the pressure of blast, as were the old pyrometers, assisted, with the cold blast mixer, in maintaining known and constant temperatures of the blast. It also helped to show whether stoves were clean and whether the stoves were getting their share of furnace gas.

In conjunction with top registering automatic stock gauges, showing whether the furnace is filled regularly and level, the checks and tabs on conditions are nearly complete. Theoretically a furnace should be left alone and these indices help to keep conditions constant, but there are places where coke is expensive, which carry a dangerously narrow margin of fuel, robbing the boilers to help out the stoves with more gas and falling back on slackened revolutions when some slight variation in fuel, stock or treatment has disturbed the balance. The management of such plants is a care and in the long run averaging up casualties and sick periods the wisdom of the method is questionable.

As the modern engine met the requirements of high pressure and Mesabi ores so the decreased silicons and regular product played into the demands of the direct process and increased converter tonnage. But these lower silicons and regular iron were not satisfactorily obtained before some conclusions were reached from the study of furnace dimensions. After a series of investigations and gradual changes (more easily experimented on with flexible bosh plates than with the steel bosh jacket) boshes were lowered. One effect of low bosh is to do away with slipping in the lower part of the furnace and by permitting a limy cinder without slips permitted also the production of low silicons with low sulphurs.

As mentioned in a former article, the raising of the height of a furnace has not proved itself a correct move and several conspicuous and expensive mistakes have taught that the product is more a function of equipment than furnace size—forgetting temporarily the chemical aspect.

The variations in the diameter of hearth have been practically commensurate with the increased volume of wind, though how much it influences production is not clearly known. With same quantity of wind and stock two furnaces of hearth diameters differing by a foot have been known to produce the same tonnage. A large hearth in its resemblance to increased grate area under a boiler suggests its capacity to burn coal and coke more rapidly than one of smaller diameter. It at least allows a larger quantity of metal to be retained in the furnace without increasing the height of the bath, and deep baths of molten iron churned up by the blast are apt to break out—an awe-inspiring catastrophe.

Being now convinced that a blast furnace should be run on the principle of avoiding rather than getting out of trouble, very little jockeying with conditions at a well run plant is allowed. The volume of wind is increased after blowing in—after first week—very slowly through a long period, until the limit of that furnace and equipment and market condition is reached. It should be added that with Lake ores the limit of time of passage through the furnace has not been located. Oscillations in steam pressure from the varying nature of the gas are compensated and balanced by universal steam mains connecting many furnaces. The study of records of atmospheric humidity and dew point have taught us the variations to be expected in summer and winter weather.

It should also be mentioned that uniformity of working now being the rule, in imitation of coke margins the margin on labor can be cut down. The duties and operations have acquired a clock-like precision and routine, enabling the capacity of the individual to be accurately gauged. This is the least important phase in the cost of manufacture of pig, constituting but from 5 to 15 per cent of the whole and should be the last to receive serious attention. In the recent wave of mechanical innovations labor economy has been given undue prominence, particularly in a brisk market.

These deductions would not have been quickly reached in an isolated plant where the manager is "wrapped in the solitude of his own originality," but owe their quick origin to the grouping of many units together under one executive. By varying one condition at a time, keeping the others constant, the resulting changes could properly be attributed to that one move.

It should not be omitted that the work of scientists in fields of knowledge unapplied both at universities and colleges, and by some organizations broad and rich enough to make pioneer investigations, threw light on many laws governing our variables, saving the furnace operator much initial and tentative work. We owe much to the theoretical dreamer; and while appreciating that he overdid "deductions" and slurred the pursuit of facts two centuries ago, at many manufactories nowaday it seems to me the antithetical vice reigns.

There are a few interesting problems and steps obtrusively confronting us: the greater calorific efficiency of gas engines; the influence of temperature of blast on combined carbon; the relation of number of tuyeres to hearth area and ores used (some able men still preferring more than 12 tuyeres); determining whether the elimination of moisture is economically feasible; the best size and limit of possible strength of fuel—a continuation of Sir Lowthians Bell's investigations; a study of top pressures and why the advantages resulting from hot blast are so greatly in excess of the expectations permissible from the amount of gas burnt in the stoves; a study of the relations between cubic feet of wind theoretically required to burn a unit of carbon (minus amount of impregnation) and amount actually delivered to the furnace per unit charged in the top; the variations in volume of wind per pound of fuel burnt with high and low silicons, etc.

It would seem outside of gas engines we have made most of the moves promising large returns; though it would be rash in view of past developments to believe or act upon it. Mr. Blair's experiments must always prove fascinating to many.

The lease of the Dominion Coal Co. to the Dominion Iron & Steel Co. is expected to be made on a basis of 8 per cent. The preferred stock and bonds of the coal company are to be retired by an issue of $6,000,000 5 per cent bonds with a sinking fund of $75,000 a year. A director states: "It is estimated from the present business that the earning of the coal company the coming year will be $2,350,000, which is sufficient to pay the interest on the new coal bonds, the $75,000 sinking fund, the interest on the $8,000,000 Dominion Steel 5s, and the 7 per cent interest on the $5,000,000 Dominion Steel 5s and the 7 per cent interest on the $5,000,000 Dominion Iron & Steel preferred, so whatever the steel company earns itself will go absolutly to the common stock of the company." It is stated that the steel company is now producing 150 tons of billets per day. By May 1, it should be producing 300 tons per day and this amount should be increased to 500 tons by July 1, and to 700 tons by Oct. 1, which would give a production of 120,000 tons of billets this year. There is a possibility that the rail mill will have some output in 1902. Its completion is expected in October.

A NEW TYPE OF ELECTRIC CONTROLLER.

As all users of electric controllers have discovered no one design of controller is best adapted to all varieties of service. With this fact in view the Electric Controller & Supply Co., of Cleveland, has added to its line a new controller known as the type "U". The arrangement and construction is particularly adapted to the control of standard cranes and other electrically driven machinery which is not subjected to excessive overload. Fig. 1 shows a front view of the type "U_1" controller. Fig. 2 is a rear view of the slate face showing the resistance units and connections. It will be noted that all of the working parts of the controller are carried by the slate face. The frame, which consists of a single casting, serves simply as a protection and support for the working parts. The removal of two screws frees the face from the frame and permits ready inspection of all the controller connections.

Fig. 3 shows in detail the construction of one of the resistance units. The core of the unit is a rod of soft iron over which is placed a heavy tube of asbestos. Caps are provided at either end of the tube for receiving the ends of the resistance winding, the cap at the rear end of the tube being of insulating material and that at the forward end being of copper threaded on to the iron core. The core is extended beyond the copper cap and passes through the slate face where it is

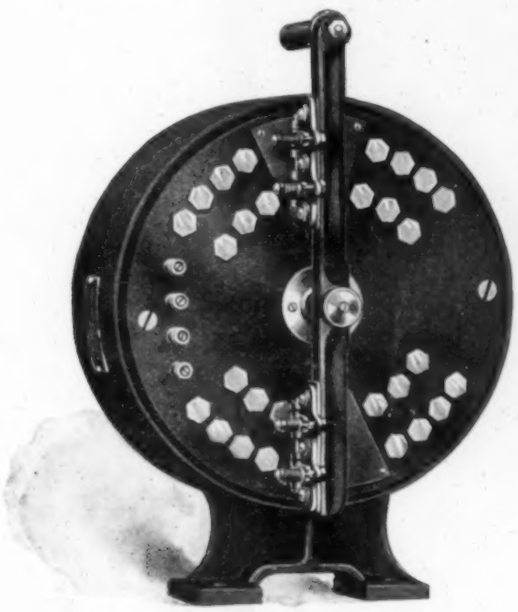


FIG. 1.—FRONT VIEW OF THE CONTROLLER.

locked in position by a lock nut working in a counterbored recess. The contact button, which is drop forged from pure lake copper, has an octagonal head which is grasped with a wrench and screwed in place on the end of the core. It will be seen that by this construction the contact button can be removed and replaced without in any way disturbing the resistance unit or its connections. Further, the core of the unit performs three functions; first, it carries the forward end of the resistance winding to the rear end of the unit, thus bringing all connections to the various units into one plane; it also connects the resistance winding to the contact button, and lastly it forms the core of a powerful electromagnet of which the turns of resistance material form the exciting winding. By this construction each contact is placed in a powerful magnetic field of its own and an efficient blow-out provided. When the current is unusually strong and the danger of arcing increased, the magnetic field is stronger, thus automatically adjusting this device to the demands upon it.

Another unique feature in the construction of type "U" controllers is illustrated in Fig. 4. The frame is finished with four bosses set 90 degrees apart. By altering the two screws which hold the face in the frame the controller may be adapted to a variety of methods of support, maintaining the operating lever in a vertical position. To give further flexibility the handle is adapted to be attached to the operating lever in three positions, at right angles to it, on either side, or screwed directly into the end of the lever.

Fig. 5 shows the type "U" controller adapted to an overhead support and operated from the floor by means of chains or ropes. A powerful spring return is provided which replaces

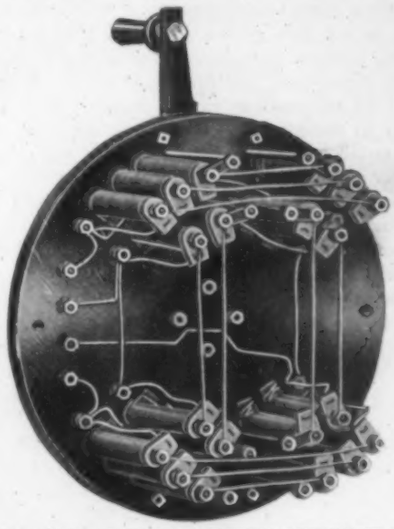


FIG. 2.—REAR VIEW OF THE SLATE WITH RESISTANCE UNITS AND CONNECTIONS.

the arm in the off position when the ropes are released. The pleasing appearance, accessible arangement and general adaptability of these controllers are their special points.

STEEL INGOT CAPACITY OF U. S. STEEL CORPORATION.

The capacity of the production of steel ingots of the various constituents of the United States Steel Corporation is given in Swank's directory as follows:

	Long tons.
Carnegie Steel Company	3,900,000
National Steel Company	2,210,000
Illinois Steel Company	1,675,000
American Steel & Wire Company	1,300,000
Lorain Steel Company	550,000
National Tube Company	480,000
American Sheet Steel Company	247,000
	10,362,000

In the year 1901 the Carnegie Steel Company produced 3,500,000 tons of steel ingots, or 90 per cent of its capacity. This was doing very well as the figures given in the table represent the totals of the maximum rated capacities of the several steel making departments of the company. Should the corporation follow the policy of keeping its plants busy at whatever price can be gotten for the product—and there is no reason to suppose it will not—its constituent plants can be counted upon for over 9,000,000 tons of steel ingots a year. The total steel production of the whole country in 1899 was only 10,600,000 tons, and in 1900, 10,200,000 tons. The production last year was probably close to 13,000,000 tons. In a year of moderate de-

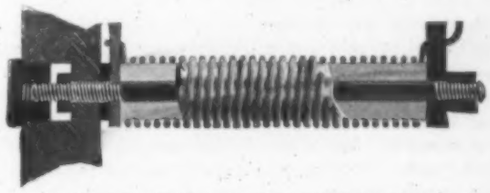


FIG. 3.—SECTIONAL VIEW OF A RESISTANCE UNIT.

mand or actual depression it is fair to assume the plants of the United States Steel Corporation could produce very nearly the entire output.—[Tin and Terne.

The Duffs Patents Co., manufacturer of the Duff patent water seal gas producer, announces the removal of its offices from the Empire building to the Frick building, Pittsburg.

THE VALUE OF UP-TO-DATE TOOLS.*

BY M. K. BARNUM, MASTER MECHANIC UNION PACIFIC RAILROAD.

The amount of money that is wasted every day by the lack of "up-to-date" tools is appreciated by very few railroad officials. Even many superintendents of machinery and master mechanics do not fully realize the saving that can be effected be replacing worn out and obsolete machines with others which are strictly "up-to-date" and fitted with all the latest improvements. If an old machine can be replaced with a new one which will do enough more work or do the same work with enough less labor to represent a saving in money equal to 5 per cent per annum on the investment, it should be entitled to careful consideration, as this is the basis on which other railroad improvements are figured. How easy, then, ought it to be for mechanical men to obtain approval on a requisition for a machine which will save from 10 per cent to over 100 per cent per annum on the investment. A few actual examples of such savings may be needed to convince those who have not studied this question, or others who have not had the new machines to compare with old ones.

(1) In a railroad shop employing about 160 machinists there were no horizontal boring machines for such work as boring driving box brasses, rod brasses, rocker boxes, air pump cylinders, etc., and all such work had to be done in lathes, milling machines or drill presses.

After repeated conferences and much argument, accompanied by estimates of savings that would result, permission was obtained to order a No. 2½ horizontal boring and drilling machine with 4-inch bar and latest attachments. It has been in use about eighteen months and shows earnings by money saved as follows:

Original cost of machine installed ready for work	$1,696.00
Average savings per year as compared with old manner of doing same work	900.00
Interest on investment	53%

It formerly required three hours to bore a driving box brass for a 9x12-inch journal in a milling machine and about four hours to do the same work in a lathe, whereas they are now bored in one hour in the horizontal boring machine. Rocker boxes, tumbling-shaft boxes, etc., are done in one-half the time formerly used.

In boring air pump cylinders it was formerly necessary to take the pump apart and set and bore each cylinder separately, requiring from two to three hours each. In the new machine it is possible to bore all four cylinders of a New York pump at one setting, without taking them apart, and requires but an average of one hour for each cylinder. In addition to the saving in time, much greater accuracy is insured. It is very conservative to say that this machine does double the work of the old ones, thereby saving the wages of one machinist at $3.00 per day for 300 working days, or $900.00 per year.

(2) An old car wheel borer was replaced by a new, heavy 42-inch borer with hub-facing attachment, power crane for handling wheels, etc., which cost installed, $1,710.90. This wheel borer saves the wages of one helper three hours a day and does more than double the work of the old machine, making a total of $2.45 per day, or $735.00 a year, which amounts to 42½ per cent on the investment.

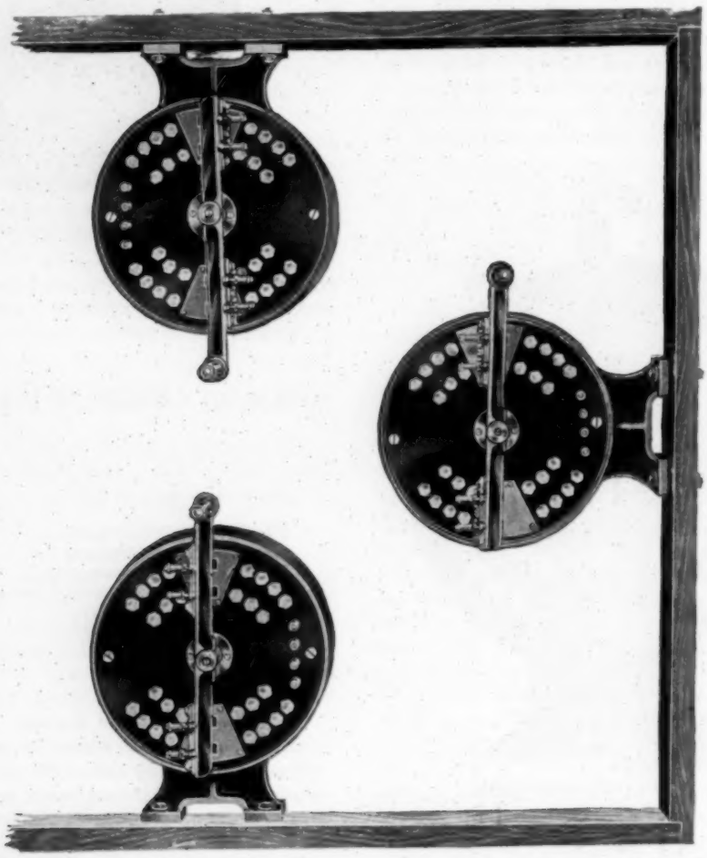


FIG. 4.—SHOWING THREE POSITIONS TO WHICH THE CONTROLLER MAY BE ADAPTED BY ADJUSTING TWO SCREWS.

(3) A new, heavy, double head car-axle lathe, costing $1,665.00 installed, turns out one-third more work than the old one on account of taking a heavier cut and heavier feed, thereby saving about $250.00 a year, or 15 per cent on the principal.

A long list of such examples could be given to show the increased earning power of machine tools which are strictly up-to-date. Tools are not up-to-date when there is something else on the market which will do more work or do it at less cost of labor. They need not necessarily be worn out to be wasteful by comparison.

Most engine lathes of modern design have greater power, weight and strength to withstand heavier cuts and coarser feeds than those built 20 or 25 years ago, which enables the former to turn out from 20 to 30 per cent more work. This represents savings equal to from 15 to 35 per cent interest on the investment, varying with the cost of the lathe and the class of the work for which it is used.

Recent planers are built 30 to 50 per cent heavier than they were 20 years ago, with greater power and quicker return, the

*Read at a meeting of the Western Railway Club, Chicago, Ill.

latter running as high as 72 to 80 feet per minute as compared with 40 feet or less for the older machines. They are also fitted with three or four tool heads, whereas the old planers had only one or two at most. This means an increase of 25 to 50 per cent in the amount of work done, or earnings of 10 to 25 per cent on the amount expended for the machine.

The various types of turret lathes for making bolts, studs and pins from bar iron are well adapted to locomotive work and will easily turn out twice or three times as much of this class of work as will an ordinary old style engine lathe. Such machines cost $1,600.00 to $1,800.00, and make a return of from 50 to 60 per cent in savings. The large automatic turret lathes for turning piston heads, cylinder packing, bull rings, balanced valve rings, etc., will do double the amount of this work that an engine lathe will, and the same may be said of the latest boring and turning mills.

rate of interest on the investment than larger and more expensive ones. There are very few railroads today which have not more or less pneumatic drills, hammers, riveters, hoists, etc., and no argument should be necessary to demonstrate their earning capacity, but the value of air jacks for cars and locomotives is not so generally known. It formerly required about four hours for eight men with screw jacks to take a 10-wheel engine weighing 132,000 lbs. off its drivers, at a cost of $5.14, and about one-half that time for four men to do the same work with hydraulic jacks, but using four pneumatic jacks, it is now regularly done by four men in one hour at a cost of 66 cents. However, to be strictly up-to-date an electric crane should be used and the time reduced to ten minutes.

A pneumatic ram was recently made at a cost of $168.55 for breaking staybolts to remove worn out fire boxes, which earns very large interest on the investment. It formerly cost $45.60

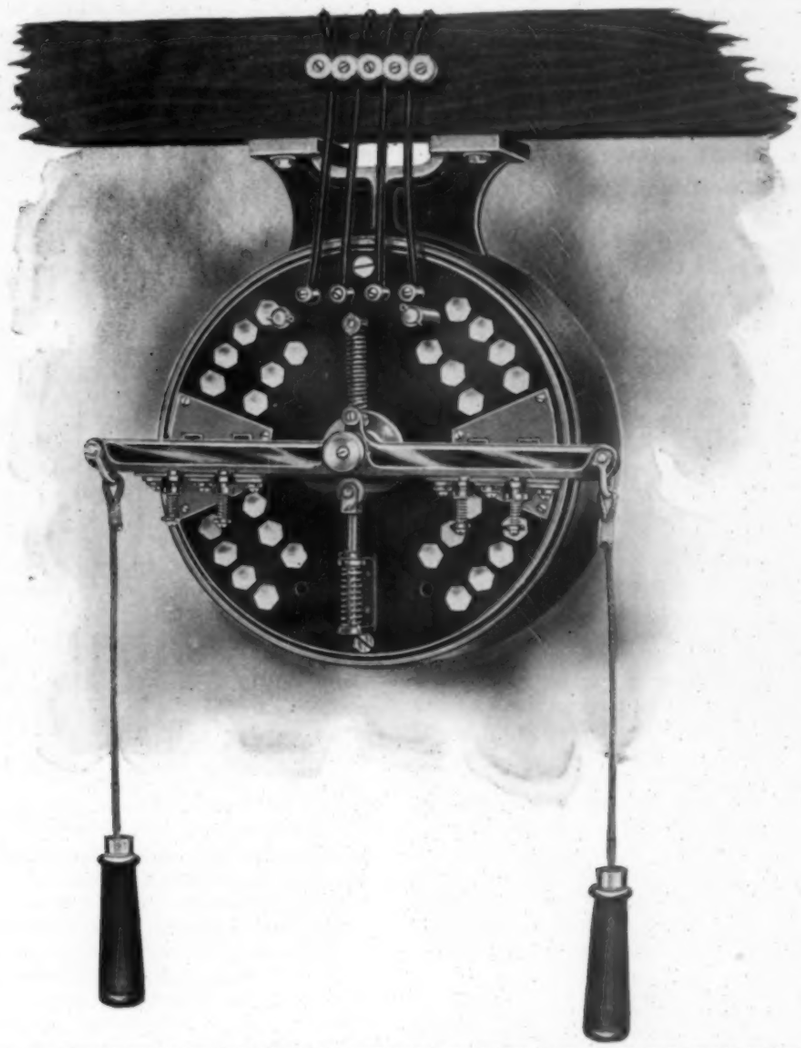


FIG 5 —THE CONTROLLER ADAPTED TO OVERHEAD SUSPENSION AND OPERATED FROM FLOOR.

Many improvements have been made in drill presses, among which may be mentioned easier and quicker adjustments, tapping attachments, multiple spindle drills, variable speed of both spindle and work, swiveling tables, tapping attachments, multiple spindle drills, variable speed countershafts, etc., all of which help to increase the output.

Milling machines are great time savers on certain classes of work which used to be done on slotters, shapers or planers and are especially economical where a large number of duplicate parts are to be made. Every tool room ought to have at least one universal milling machine and there are various jobs of locomotive work that can be done to great advantage on such machines. The percentage of saving to be obtained depends not only on the original cost and amount of additional work done, but also on the rate of pay and skill of the operator and the number of hours the machine is run.

As a rule, improved small tools will therefore earn a larger

to cut out the crown bolts and staybolts of a 10-wheel locomotive with 9-foot fire box, using three men, but with the pneumatic ram it is done by two men for $15.20, thereby saving $30.40 on each fire box. If only one fire box was removed each year this tool would earn 18 per cent on the investment, but as this shop applies 30 new fire boxes a year the saving amounts to $912.00, or 541 per cent per annum on the amount invested.

The improvements and radical departures during the past ten or fifteen years, from old practice in the manufacture of machine tools for metal working, have been much greater than in wood working machinery, but recent designs of planers, tenoners, molding and mortising machines are much heavier and more powerful and will do from 25 to 50 per cent more work than old machines. The hollow chisel mortiser is an ingenious and very profitable tool for any shop, and the four and six spindle boring machines are great labor savers. Wood trimmers are most valuable additions to the equipment of

cabinet or pattern shops, and the new pattern and corebox machines will easily earn 100 per cent on their cost if used one hour a day.

In figuring the earnings of the "up-to-date" tools in the above example, only average results have been taken and not special cases of unusual savings. No credit has been allowed for the scrap value of the old machinery thrown out, nor have we considered the saving in shop room due to the use of more efficient tools; and last, but not of least importance in railroad work, is the reduction in the number of days locomotives must be held out of service for repairs, which will follow the use of up-to-date machinery.

In a certain shop which makes general repairs to about 160 locomotives a year the average length of time required to put each engine through the shop was reduced from 34 days in 1898 to 30 days in 1900. This represents a saving of 640 days for one locomotive which, at a rental value of $10.00 a day, gives $6,400.00. As this was done with the addition of only a few new machines in a shop full of old and worn out tools, many of which had been in service from 25 to 35 years, you can readily understand how much greater saving could be effected had the shop been fully equipped with up-to-date machinery.

A Law for the Steel Corporation's Bonding Scheme.

Important changes in corporation laws were made by the New Jersey legislature last week, and the new provisions will permit the United States Steel Corporation to carry out its plan to substitute $250,000,000 worth of 5 per cent bonds for $200,000,000 of 7 per cent preferred stock. The measure was not passed by the legislature as originally presented, being amended considerably before being favorably acted upon. The first bill provided that with the consent of two-thirds of the stockholders present in person or by proxy a resolution of the stockholders might effectuate a bond issue to retire the preferred stock and to issue bonds in its place. The amendment provided that the directors should first pass a resolution declaring this advisable and giving their reasons; also, that a copy of the directors' resolutions, with a notice of the meeting, must be sent to every stockholder of record; that thereafter, on proper notice, a stockholders' meeting might be called to vote the bond issue.

Instead of a two-thirds vote of those present per capita, the law now requires the vote of two-thirds in interest of each class of stock, so that two-thirds of the common stock present may consent to this amendment. The result of this is to give full publicity both to the proposed measure, and in the second place to require the consent of two-thirds of the attending common stock holders to a change in their relations. The other two amendments are along the lines of preventing insolvent concerns from taking advantage of the provisions of the act by permitting any corporation to turn its preferred stock into bonds ahead of the other creditors. The objection to this provision of the original bill was that it reversed the law of New Jersey and of all other states, which was to the effect that creditors should come ahead of stockholders on a liquidation.

As the bill is now drawn no corporation but a solvent one can take advantage of its provisions, because in the first place the preferred stock must have been a dividend-paying stock to the date of the passage of the resolution for the issuing of the bonds. In the second place, before the bonds could be issued there must be a certificate by the officers of the company that the assets of the company, after deducting all liabilities, must be equal to the amount of the preferred stock issued and outstanding, and for which it was proposed to issue bonds. This provision puts a different aspect upon the bill as first introduced. It prohibits the issuing of bonds for anything but assets, dollar for dollar. The preferred stock must represent actual assets over and above all liabilities before any preferred stock can be turned into bonds, and this is the essential difference between the old bill and the new. The restriction upon the conversion of the preferred stock into bonds removes the objection that it might be funding worthless stock, and putting the claims of such stockholders ahead of bona fide creditors.

It is to be said in behalf of the bill as amended that it now supplies the only legislation there is in New Jersey upon the subject of bond issue. To this extent, it is said, the measure is desirable for all corporations. The bill was also amended by inserting the provision ten years, which means that in case a corporation was likely to fail it could not issue short-term bonds, which would mature in a short time, thus enabling the stockholders, converted into bondholders, to realize on the assets ahead of bona fide creditors. In other words, it makes stockholders whose stock is converted into bonds long-time bondholders, and puts off the maturity of their claims, so that they cannot force them for ten years.

PROF. SWEET ON THE METRIC SYSTEM.

Prof. John E. Sweet, of Syracuse, N. Y., writing in the *Engineer* on the metric system, gives some good reasons for the retention of the present system of measures in the United States, albeit they will not entirely commend themselves to men who "do figuring":

"It is not true that one in ten who trade in machine tools in foreign countries favors the change, and suppose everyone who has dealings there were in favor of it, would it not be a liberal estimate to say that it is a hundred thousand of our people? If you do not think one hundred thousand is liberal let us say a million. How many million are there now and how many more million in years to come will there be to whom it would be all sorts of expense, a perfect nuisance, rendering all the present books and tables obsolete, or for one to read them, making it necessary to interpret everything relating to distances, sizes and weights, to be understood?

"To figure, the metric system is the best; to measure anything, it is just as good and no better than our own; to work with, it is not half so good. How many workmen do we have to one figurer? The experience of over forty years of William Sellers & Co., Inc., where the two systems have been worked side by side for that length of time, is evidence that no amount of theory can upset. Worst of all there is no possible way to avoid carrying on the two systems as long as machines now made have to be repaired, or at least except by making things in inches and calling them French names, which is just exactly what they do more or less, even in France, to some extent and in the other countries to a greater extent.

"No one advocating the metric system ever acknowledges that our system possesses any merit. No man can make out of the metric system a tool for the mason and the carpenter comparable to the steel square. No one can make a tool for measuring by the metric system comparable in convenience to the two foot rule. It is not possible to get the range of units out of the metric system that we get out of the English; and all our units are commensurate one with another as well as with the French. We have the mile, the rod, the yard, the foot, the inch, the ½ inch, ¼ inch, ⅛ inch, 1-16 inch, etc., and each becomes a unit when we are working to a scale. Building plans are drawn to a scale of ¼ inch to the foot. There is nothing in the metric scale that fits it. We can draw plans ½ size, ¼ size, ⅛ size, etc., without running into fractions.

"The using of the multiple of ten was the first system and is still in use by the Orientals, but when civilized nations began to make things by rule and standards, they drifted into the more convenient system, and our present system is the survival of the fittest. There is no sense in making laws that people cannot and will not obey. The American people cannot change their practice at once and they will not change a good system which we have been so long accustomed to and which we have spent so much money to build up, to a bad one through a series of years, because its weakness will show itself.

"Other nations, it will be claimed, have done this. They had no system when they adopted it, and any system of standards, however bad, is so much better than no system, that they are naturally satisfied. What is there about the use of the metric system that will compensate the farmers, the housewives, the grocers, the builders and the merchants for the cost of furnishing themselves with new scales and new measures? What the factories of all kinds to change their looms, the shops to carry two sets of gages, and a double stock of sizes, the rolling mills two sets of rolls? When this is looked into from all sides, it seems to me that every one except the man who has figuring to do must see that it's a wild scheme, a useless thing, a hopeless failure."

THE FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Foundrymens' Association was held at the Manufacturers' Club in Philadelphia on Wednesday, April 2, the president, Thos. I. Rankin, occupying the chair.

The following were present: Jas. S. Stirling, Harlan & Hollingsworth Co., Wilmington, N. J.; Douglas G. Moore, Saml. L. Moore & Sons Co., Elizabeth, N. J.; C. Kirchhoff, *Iron Age*, New York, N. Y.; P. D. Wanner, Reading Fdy. Co., Reading, Pa.; G. W. Vantine, Singer Mfg. Co., Elizabeth, N. J.; C. D. Matthews, Camden Iron Works, Camden, N. J.; C. D. Nourse, Alexandria Iron Works, Alexandria, Va.; Thos. B. Harkins, Harkins Foundry Co., Bristol, Pa.; J. Henry Pepper, *Iron Trade Review;* A. G. Warren, J. W. Paxson Co.; H. B. Lincoln, James Smith Woolen Mach. Co.; E. E. Brown, E. E. Brown & Co.; W. D. Koch, Philadelphia Sash Weight Works; Benj. Fox, Philadelphia Sash Weight Works; Dr. Edw. Kirk; J. Thompson, J. Thompson & Co.; H. O. Evans, Thos. Devlin & Co.; Thos. Devlin, Thos. Devlin & Co.; Wm. Hanson, Penna. Iron Works Co.; Geo. C. Davis, chemist; H. L. Haldeman, Pulaski Iron Co.; Mr. Hardy, Penna. Iron Works Co.; A. A. Miller, *Iron Age;* Thos. Hobson, *Iron Age;* Jas. L. Keightley, Geo. V. Cresson Co.; Oregon J. Ward, Howe Scale Co.; W. J. Faux, Geo. W. Ellicott, Southwark Fdy. & Machine Co.; Andrew Barr, Howard Evans, J. W. Paxson Co., and John Birkinbine, all of Philadelphia.

The first business taken up was that of incorporating the association. P. D. Wanner, in support of the idea, detailed certain changes in the constitution and by-laws, which would have to be made before application could be made for a charter. He then moved, and the motion was seconded by Howard Evans, that the changes suggested be made and adopted.

The election of trustees followed, Secretary Evans placing in nomination John E. Harbster, of the Reading Hardware Co.; Charles S. Prizer, of the Prizer-Painter Stove & Heating Co., and P. D. Wanner, all of Reading, Pa., from which place application for the charter is to be made. They were unanimously elected.

The paper of the evening was by Charles Kirchhoff, editor of *The Iron Age*, New York, and dealt with "Trusts and Their Effect on the Business World." The paper, which was not filed for record, was very interesting to all present. The author took the standpoint that in general the consolidations, or so-called "trusts" had proved beneficial to the trade at large, particularly the jobbing trade, and many evils existing in the trade had been corrected. At the conclusion of the reading of the paper, which was quite lengthy, a vote of thanks was extended to Mr. Kirchhoff.

Discussion.

Mr. Devlin: There is one point brought out in the paper that does not agree with our experience, and I would like to set Mr. Kirchhoff right in regard to it. It is this, that goods are sold by American manufacturers abroad for less money than at home. Our experience is just the reverse. We have been getting better prices abroad than at home, and had it not been for our home competitors we should have got even better prices. That applies to small shelf hardware.

Mr. Kirchhoff: What I had in mind particularly were those goods not specialties, heavy lines in which international quotations told their story in a moment, and in which that method of marketing in other markets is pursued by every great producer in Europe.

Dr. E. E. Brown: Are we to understand from that that in every manufacturing country they have their trusts, understandings, and agreements to such perfection that they can keep these prices higher than in non-manufacturing countries?

Mr. Kirchhoff: In Germany and France such things do exist, but in other countries there are prices for home consumption and for export, and home prices are always higher. You see it is the consumer's market which controls.

H. O. Evans: We are looking on our home market here as of the United States. Is Germany's home market relatively as important to her as our own?

Mr. Kirchhoff: The larger part of Germany's goods are consumed at home, but the quantities for export vary a good deal. In the past year they have increased their exports 50 per cent, because their home market would not take the goods. Again, if you were a manufacturer there, say of wire, you would receive an export bounty on rods. They have a protective tariff to take care of, of course.

P. D. Wanner: We have all been thinking about these questions of consolidation, as to their effect or influence; but there are few of us who have the boldness to write or speak of them, on account of the disagreement existing among us on the subject, and also owing to its general delicacy. Indeed, there are few who have had the courage to write or speak on the questions that are affected by these consolidations. I have stated in my own way here during the past few years that they were simply matters accruing out of the evolution taking place in the business of the industrial and commercial world. First we had hand power, then horse power, water power and steam power; now we have gas and electric power; and it is just so in the evolution of business which has produced consolidations. I take it for granted that, after all, these consolidations are in the direction of progress, but it is necessary that they be changed and modeled to such an extent that finally they reach a point where they do all that could be expected of them for civilization and humanity. As far as the labor movements are concerned the labor organizations had a great deal to do in effecting these consolidations. In other words a union on the part of labor necessarily brings about the same union on the side of the producers. It is one against the other, and yet there must be reason and confidence between them to bring about the best possible results. I think nobody need interfere in these matters.

John Birkinbine, upon invitation then addressed the meeting in part as follows: It is a hard subject for me to talk on. When I went to school a million dollars seemed a great big sum, and I have not yet learned to appreciate any figures I cannot count on my fingers. With the many consolidations before us I must confess I take the figures connected with them in homœopathic doses. I think there is a great deal of good as well as a great deal of danger in them. One point appeals to me, and I may be wrong, and that is that the consolidation as effected today is eliminating very largely from business the factor of personality and competition. It is eliminating from our business a great many of the men who have made the business what it is, and the business is put into the hands of entirely new men. If you effect a great consolidation, who naturally will be your manager? Will it be the men who have built up the concerns? Will those men who have been active be the directors after somebody else is furnishing the money? No, a new control comes in, made up of millionaires, and this looks to me like one of the dangers of consolidation. First it will take the business from the men who have built it up, the men familiar with the details. Now when you have a business which presents details too big for anyone to manage, when they are too big for the managing spirit to keep track of, then it is all too big. Placing one man as manager in control does not compensate for relegating men who have been instrumental in making the different plants what they are to subordinate positions. The men who have been general managers of individual plants are put in control as general managers of consolidations; but if you want anything improved you will have to look beyond them, and that is a backward step. The success of our iron industry is due to the fact that one concern has endeavored to outbid its competitor, by having better management, better plant, and keeping closer to details. Who made our improved engines, our improved roads, our improved furnaces? Why, the practical men in the various departments of various works in order to overcome the disadvantages they were laboring under, or believed they were. Would I, as a designer, feeling I held an improved design with which I could better compete with you, have the same interest with half a dozen companies under me, in getting the best out of everything. A danger is that the individuality which has done so much for us will be swamped in the larger order of things. I do not believe we shall all be consolidated. It would hardly be, to my mind, judicious for the steel corporation to own all the works if they could, for if they did they would then be monopolists. They can well afford to let other large concerns operate, and the public will appreciate those other concerns as being a check on monopoly whether they are or not. As far as trusts are concerned I think Mr. Kirchhoff has fairly told us their advantages and disadvantages, and that there is a channel which lies between the two extremes which

might cause disaster on either side, and it will be largely due to the personnel of the management and men as to whether they will safely pass that channel or not.

After adjournment the usual luncheon was served and a pleasant hour spent in speech-making.

Central Western Blast Furnace Situation.

At a recent meeting of the furnace operators in the Mahoning and Shenango Valleys with representatives of the American Steel Hoop Co. and the National Steel Co. it was decided to oppose the demands of the furnacemen for an eight-hour day which is to become effective on May 1. The blast furnace workers according to their claims have not only the furnaces in the Valleys organized, but those in the Pittsburg district as well. This is not the case, however, and it is not believed that if even a strike is declared the furnaces in the Pittsburg district will be effected. Many of the furnace operators are in favor of granting the men a slight advance in wages, but they will not concede the 8-hour day, and if the men will not alter their position a strike will no doubt result. Whether the organization, which is still young, will be able to force all the men out is a question, and some of the local labor leaders seem to favor a slight advance in wages in preference to a shorter day. The top and bottom fillers are the men asking for a shorter day, together with the men in the cast houses, the laborers not joining in the movement. It is not known whether the workers at furnaces where this work is done by machinery, and where no cast house men are required, are organized. If they are, the operators at these plants have not received any formal notification of the demands. The organization has not gained any foothold among the furnaces in the Pittsburg district, and it is doubtful if the men employed at these furnaces could even be called out on a sympathy strike.

The 38,000 locomotives in the country are in most States left to the care of their owners, upon the presumption that self-interest will lead them to see that the boilers are well made and properly cared for. Navigation is under government control, and 63 boiler inspectors are kept in government service. The last two censuses have not counted the stationary boilers, but in that of 1880 their number was placed at 72,304. The *Locomotive* estimated it ten years later as 100,000; the same authority now estimates it as 170,000. The Hartford Steam Boiler & Inspection Co. now has insurance on 83,907.

At the Baldwin Locomotive Works the business activity is even more marked than usual, and preparations for large deliveries are very apparent around their shipping departments. Deliveries on orders from the Pennsylvania Railroad covering 60 large locomotives are under way, and powerful locomotives for other roads are being pushed out of the shops. Twelve large freight locomotives are leaving for the Government Railway of West Australia. Both inquiries and orders are plentiful, and the contracts on the books insure the running of the works to their fullest capacity for some months to come.

The H. W. Johns-Manville Co., New York and Milwaukee, has received an order from the Pacific Coast Oil Co. to cover about 250 miles of 8-inch pipe, which is to be laid from Bakersfield to Port Richmond, Cal. This is reported to be the largest order for pipe covering ever placed.

De Camp Brothers & Yule, of St. Louis, dealers in pig iron and coke, announce that their name has been changed to De Camp Brothers & Yule Iron, Coal & Coke Co. The capitalization of the new corporation is $300,000, fully paid. The officers are: A. P. De Camp, president; Wm. Yule, vice-president and treasurer; F. B. De Camp, secretary; A Yule, assistant secretary.

The Carborundum Co., of Niagara Falls, N. Y., reports that while the increase in sales for the first quarter of 1901 was 35 per cent greater than that of 1900, the increase during the first quarter of this year was 41 per cent over that of the corresponding quarter of 1901.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of their Wants:—

The Paris Plow Co., Paris, Ont., has been organized with a capital stock of $250,000. The company will build a plant for the manufacture of agricultural implements. Frederick Wiard, formerly of Batavia, N. Y., will be superintendent and manager.

The Southern Railway will make extensive improvements in its shops at Spencer, N. C.

Alexandria Overall Co., Alexandria, Va., wants addresses of firms manufacturing machines for making wire buckles and tacks.

Maryland Foundry & Machine Co., Baltimore, Md., is in the market for a second-hand engine, of 8 to 10 horsepower.

John Davis, 81 Haverhill street, Boston, Mass., wants 300-horsepower high-speed engine.

Houston Bros., Vicksburg, Miss., is in the market for a second-hand iron planer to cut about six feet in length; also second-hand bolt cutter.

James A. Dale, 108 North College street, Nashville, Tenn., is in the market for two 70-horsepower boilers, 40-horsepower engine and suitable pump, to be built in 300-pound sections for muleback transportation in mountains of Mexico.

The Chattanooga Bridge Co., Chattanooga, Tenn., has been incorporated with a capital stock of $10,000.

The Oswald Iron Works, Limited, New Orleans, La., has been incorporated with a capital stock of $20,000, to operate foundry and machine shops. Charles G. Oswald, Robert E. O'Connor, H. L. Loomis are the incorporators.

The Federal Mfg. Co., Washington, D. C., has been incorporated to manufacture small machines and novelties. N. L. Collamer is president; H. H. Burrough, vice-president; A. V. Davidson, secretary, and H. A. Parks, treasurer.

Gordon D. Canfield, Washington, D. C., wants prices and catalogues for equipment of foundry and machine shop.

The LaCrosse Plow Co., LaCrosse, Wis., which is building a new plant, mention of which has been made previously in these columns, will want two boilers, engine and two pumps, etc.

The Voss Bros. Mfg. Co., Davenport, Ia., which is adding a two-story building, 64x150 feet, to its plant, will install in this structure an 80-horsepower engine, boilers and other machinery.

The Apple River Power Co., New Richmond, Wis., contemplates improvements consisting of the installation of a power-transmission plant of about 700 horsepower capacity, to be equipped with a 12-mile transmission line.

The Southern Engine & Boiler Works, Jackson, Tenn., is having plans prepared for improvements to its plant to cost between $75,000 and $100,000.

The Kansas City Furnace Co. has been incorporated in Kansas City, Mo., with a capital stock of $15,000.

The Parson Mfg. Co., of Phoenicia, Ulster county, N. Y., will manufacture furnaces and steam boilers under their recent charter of incorporation. Capital stock, $100,000.

The Sterling Wrench & Tool Co., of Rockford, Ill., will establish a plant at Dixon, Ill., but will retain the office and salesroom at Rockford.

The Illinois Forging & Mfg. Co., of Chicago, has been incorporated; capital, $25,000. Incorporators: Wade Garfeld, Herbert H. Reed and Julius H. Geweke.

The Southern Illinois Machine & Foundry Co., of Murphysboro, Ill., has been incorporated; capital stock, $6,000. Incorporators: Martin Schauerte, W. H. Michael and J. T. Burton.

The Southern Car & Mfg. Co., of Beaumont, Texas, has been incorporated with $100,000 capital for the purpose of manufacturing railroad cars and appliances and machinery. W. W. Wilson, F. M. Aldridge, R. C. Duffy, W. C. Averill and J. A. Wiggs, Jr., are the incorporators.

The South Texas Iron Works, of Houston, Texas, has been incorporated with $30,000 capital. Robert Storm, J. W. Snyder and J. L. Williams are the incorporators.

The St. Louis Iron & Machine Works, St. Louis, Mo., has increased its capital from $200,000 to $500,000.

The Knoxville Wheel & Foundry Co., Knoxville, Tenn., has

been incorporated with $25,000 capital. The incorporators are W. P., D. C. and A. P. Richards and W. D. Williams and C. H. Johnson. The foundry was formerly known as the Richards Foundry.

The Page Woven Wire Fence Co., of Adrian, Mich., has been incorporated under the laws of the state of New Jersey with $8,000,000 capital. The election of officers resulted as follows: J. W. Page, Adrian, Mich., president; Austin Clement, Chicago, vice-president; C. M. Lamb, Monessen, Pa., second vice-president; Arthur B. Cody, Chicago, secretary, and L. B. Robertson, Adrian, Mich., treasurer.

The report that the Alabama Steel & Wire Co., Birmingham, Ala., intends building a furnace and steel plant is officially denied. It was stated, however, that the matter has been under consideration but nothing definite has yet been decided upon.

The Liddell Machinery Co., of Montgomery, Ala. has been incorporated with $25,000 capital to conduct a machinery and mill supply business. W. K. Pelzer, Arthur Pelzer and E. R. Taber are the incorporators.

The National Boiler Co., of Indianapolis, Ind., has been incorporated with $50,000 capital. O. M. Summons, A. J. Summons, J. H. Matthews, Clay Laremore and Anthony Stonehouse are the incorporators.

The Ohio Iron & Metal Co., of Chicago, Ill., has been incorporated with $50,000 capital. The company will deal in iron and steel products. The incorporators are Morse Dreifus, Samuel Deutsch and A. S. Louer.

The iron plant formerly operated by Curtin & Butts at Alexandria, Va., has been incorporated under the name of the Alexandria Iron Works Co., with $30,000 capital. The increased capital is to provide for extensive improvements to the foundry.

The Reddin Iron Works, of Syracuse, N. Y., has been incorporated with $15,000 capital. Matthew C. Reddin, A. S. Reddin and E. C. Sisson are the incorporators.

The Gateway City Steel Tank and Roofing Co., of LaCrosse, Wis., has been incorporated with $10,000 capital by W. P. Andrews and Joseph Oberst. The company will manufacture steel tanks and will do corrugated roofing work.

The California Industrial Co., of Los Angeles, Cal., has been incorporated recently and will shortly erect a puddling furnace, together with a merchant mill. The company also owns considerable ore land in Southern California.

The Blood Machine Co., of Hartford, Conn., has been incorporated with $50,000 capital to manufacture machine tools. L. H. Blood, M. H. Flynn and A. B. Wilson are the incorporators.

The O. Gaisler, Jr., Pattern Co., of St. Louis, Mo., has been incorporated with $4,500 capital. O. Gaisler, Jr., O. J. Gaisler and Fred Gaisler are the incorporators.

The Iron Gate furnace and the Oriskany Iron mines, twenty miles from Iron Gate, Va., where the furnace is located, and formerly owned by the Allegheny Iron & Steel Co., have been purchased by the Allegheny Iron and Ore Co. The Goshen furnace, together with the Potts Valley Mines, are also the property of the new company. Mr. L. Zender, of New York, is president, and W. W. Taylor general manager.

The Cuyahoga Wire & Fence Co., of Cleveland, O., has been incorporated with $125,000 capital.

The Hossier Gas Machine Co., of Indianapolis, Ind., has been incorporated with $25,000 to manufacture gas producing machines. E. K. Zaring, Henry Burton and Eli Zaring are the incorporators.

The Veneer Barrel Machine Co., of Chicago, Ill., has been incorporated with $1,000 capital to manufacture barrel machinery. W. J. Ott, Harry Jessup and T. V. Strain are the incorporators.

The entire plant, including furnace, ore mines and rights of the Valentine Iron Co., Bellefontaine, Pa., has been purchased by the Nittany Iron Co., for a consideration of $85,000. The new company is composed of J. W. Gephart, L. T. Munson, Frank Clemson and Archer Brown and William Sampson, of Rogers, Brown & Co. The furnace has been idle for some time but will be placed in operation as soon as necessary repairs can be made.

The Uniform Steel Co., 320 Broadway, N. Y., manufacturer of steel castings, has purchased the Eastern Carbon Co.'s plant at Rahway, N. J., for a consideration of $40,000. About $50,000 will be spent in improvements in installing new molding machines, furnaces, etc. The capital stock of the company has recently been increased to $500,000.

Pilling & Crane, Girard Building, Philadelphia, Pa., have incorporated the Northern Iron Co., with a capital of $100,000, to operate the Cedar Point Furnace at Port Henry, N. Y. The furnace is now being repaired and will go into blast early in May. It will operate on basic and mill iron.

David C. Creese, of Allegheny, has opened negotiations for the purchase of the Schrock mine car plant at Canal Fulton, O., and is now organizing a local company for the manufacture of a track-mover and other railway appliances.

The Empire Iron & Steel Co., of Niles, O., recently organized to build a sheet mill, has let the following contracts: roll train for sheet mills to the Globe Foundry and Machine Co., of Niles, O.; traveling crane to the Case Mfg. Co., Columbus, O.; main building to American Bridge Co.—the lean-tos and additions are yet to be let; boilers to the Stirling Co., Barberton O.; electric plant to the Akron Electrical Mfg. Co., Akron, O., the generator to be connected to a Brownell engine.

J. E. Steffe, of Hamilton, O., has been figuring on a new rolling mill company which will roll merchant sizes.

Fires and Accidents:—

The plant of the Ridgway Mfg. Co., Ridgway, Pa., was damaged by fire last week to the extent of $10,000.

The pattern shop of the Barber Mfg. Co., Ashtabula, O., was destroyed by fire last week, entailing a loss of $5,000.

New Construction:—

The Lee & Hoff Mfg. Co., St. Paul, Minn., have filed plans for a large addition to the present plant. The structure will be brick, two stories and basement, 48x116 feet, and will cost $8,000, exclusive of elevator and machinery.

The National Cash Register Co., Dayton, O., has had plans made for a new factory building on the site of the old foundry. The new structure is to be 360 feet long and five stories high. The new foundry is well under way and work on the factory building will commence at once. Other improvements are to be made in the plant.

A two-story addition to the Marshall Furnace Co.'s plant at Marshall, Mich., is in course of erection. It will be used as a warehouse, with offices in the front portion.

The contract for the Johnson Foundry & Machine Works Co.'s building, at Battle Creek, Mich., has been awarded to M. M. Lewis & Son for $12,000. Work will commence at once on the new plant.

The Thomas Furnace Co., composed of John M. Thomas, W. Aubrey Thomas and T. E. Thomas, of Niles, who purchased the old Minerva Furnace at Milwaukee, Wis., have practically rebuilt the structure, installing up-to-date machinery, and this week made the first cast, which was very successful. The company has ore docks adjoining the furnace, enabling it to land its ore and coal from vessels. The furnace is in charge of E. C. Crowther, well known in Cleveland as an expert furnace operator.

The Lake Shore Iron Works, Marquette, Mich., are planning to make extensive additions to their foundry and machine shops.

The Akron Electrical Mfg. Co., Akron, O., will begin work shortly on the remodeling of a part of its plant. Another story will be added to the one-story annex.

The Interstate Foundry Co., Cleveland, O., will erect an additional foundry building to its present plant. The foundry will be 300 feet long and 148 feet wide.

The Pennsylvania Engineering Works, New Castle, Pa., has let a contract to the American Bridge Co. for a new boiler-making house, 300x64 feet. The engineering company recently increased its capital stock from $500,000 to $1,000,000 to provide funds for the improvements. The company has just been awarded a contract by the Tennessee Iron, Coal & Railroad Co. for building a number of 60-ton steel ladle cars.

The National Malleable Castings Co., Toledo, O., will increase the capacity of its plant by the erection of a large addition.

The Middletown Machine Co., Middletown, O., is contemplating the erection of a large addition to its present plant.

The Sparta Iron Works, Sparta, Wis., is erecting a new forge shop 40x50 feet.

The Deming Mfg. Co., Salem, O., will shortly increase its

plant by the erection of an addition 240 feet long and 80 feet wide. It is also stated that the capital stock of the company will be materially increased in the near future.

The U. S. Wind Engine & Pump Co., Batavia, Ill., will erect a foundry 65x290 feet.

The mills of the Tyler Tube & Pipe Co., Washington, Pa., will shortly be extended at an expenditure of $60,000.

The Reading Radiator Co., Reading, Pa., is extending its foundry by the erection of an addition 60x80 feet.

It is reported that the Republic Iron & Steel Co. is contemplating the erection of an additional furnace at Youngstown, O., the additional pig iron capacity being required owing to the increase in the steel producing capacity. It is probable that the furnace will be so situated that the molten metal can be conveyed to the steel plant mixers direct from the furnace.

D. A. Tompkins Co., Charlotte, N. C., is building a foundry.

The Velie Carriage Co., Moline, Ill., is having plans prepared for a three-story building, 80x400 feet, to cost $50,000.

The St. Louis Steam Forge & Iron Co., St. Louis, Mo., has had plans prepared for a new plant, to be erected in East St. Louis, Ill., at a cost of $20,000, for the manufacture of car axles. It will be one story high, 200x400. The equipment will include six boilers, two engines, one dynamo, motor, etc. L. C. McDonald, president.

J. R. Kimball, Moline, Ill., will build a three-story machine shop, 80x75 feet at a cost of $17,000.

The Lehigh Foundry Co., Fullerton, Pa., has let contracts for the erection of new foundry buildings, 500 feet long, 45 feet wide, and 37 feet clear, with an extension 280 fet long, 30 feet wide and 17 feet clear.

The National Enameling & Stamping Co. is erecting a foundry in addition to its rolling mill at Granite City, Ill.

The Pittsburg District:—

The Firth-Sterling Steel Co., of Pittsburg, is planning to put in additional sheet mills.

The Carnegie Steel Co. will install a new 38-inch blooming mill train at its Homestead works.

The offices of Joshua W. Rhodes & Co., Fort Pitt Iron & Steel Co. and the Cherry Valley Iron Co., have been removed from the Murtland building to the Peoples' Savings Bank building, Wood street and Fourth avenue.

The Braddock Machine & Mfg. Co., Braddock, Pa., will erect a new office building, 75x75 feet, and will also make numerous changes in its machine shop.

The recently incorporated Pittsburg Piston Packing Co. has been organized by the election of Charles E. Dickson as president, treasurer and general manager, and W. H. Sponsler as secretary. The new company will act as selling agents for the patent metallic piston packing for engines recently invented by W. S. Jarboe.

Owing to a strike of the boiler makers and blast furnace builders much of the work on the new stack erection in this district is at a standstill at the present time. The men went on a strike on April 1 because their demands for $3.50 for a nine-hour day were not conceded. The strike does not affect the shop men, however. The men have heretofore received $3 for a ten-hour day.

The Standard Steel Car Co., Pittsburg, has placed an order with the Carnegie Steel Co. for 30,000 tons of plates and structural shapes, to be delivered during the last four months of the year, which will provide material for the new steel car plant which is to be erected at Butler, Pa. It is claimed that contracts for 2,000 cars have already been booked.

The Stanyon Engineering Co., with offices in the Empire Building, has been incorporated with $5,000 capital to carry on the work of the company previous to its incorporation. The incorporators are Henry Stanyon, Thomas W. Fitch, Jr., and G. E. Fitch. The company does all kinds of iron and steel engineering and makes a specialty of the installation of wire and rod mills, together with wire nail manufacturing plants.

John Exler is the head of a syndicate which last week purchased 10,000 acres of coal land in Indiana county, Pa. The new company will immediately take steps to develop the property and will erect 250 coke ovens.

The McCormick Harvesting Machinery Co., of Chicago, Ill., will erect a four-story warehouse in Allegheny at a cost of $75,000.

The Redding Engineering Co., 3123 Second avenue, recently incorporated, is preparing plans for the erection of a second story to a part of its present plant to be used as a pattern shop. The company is engaged in the manufacture of steam specialties, including heavy duty pumps.

The American Foundry & Construction Co., with offices in the Frick building, has applied for a Pennsylvania charter. Frank C. Kohne, M. Murray, C. S. Miller, J. Miller and O. Percival are the incorporators.

At a special meeting of the Engineers' Society of Western Pennsylvania, held last week, Chester B. Albree delivered an address on the convention of engineers held last summer at Glasgow, Scotland, he being commissioned as the representative of the Engineers' Society at this convention.

The Pittsburg Tool Steel Wire Co., of Pittsburg, has been incorporated with $25,000 capital. A plant will be erected at Monaca, Pa.

The Sharon Steel Hoop Co., Sharon, Pa., has awarded the Columbia Bridge Co. the contract for the erection to the building for its new large open-hearth plant. The building will be 300 feet long and 75 feet wide.

The annual meeting of the stockholders of the Pittsburg, Bessemer & Lake Erie Railroad Co. was held last week at the Carnegie building. Inasmuch as the road is leased to the Bessemer & Lake Erie railroad the meeting was an informal one. Directors were elected as follows: George E. McCague, E. H. Utley, E. H. Gary, Thomas Morrison, R. A. Franks, T. H. Given, W. W. Blackburn, William N. Frew, G. W. Kepler, Jabez T. Odell, D. M. Clemson, D. G. Kerr, Thomas H. Wells and James H. Reed. The new directors are E. H. Gary and G. W. Kepler. James H. Reed was chosen president of the directors, Jabez T. Odell, vice-president, and G. W. Kepler, secretary and treasurer.

General Industrial Notes:—

The headquarters of the Parkersburg Iron & Steel Co. have been removed from Pittsburg to Parkersburg, W. Va., where the plant is located.

The new sheet mill of the Ashland Iron & Steel Co., Ashland, Ky., will be placed in operation in about 30 days. The main building, which is 420 feet long and 100 feet wide, is completed, as well as the heating furnaces. The furnaces consist of six sheet, six pair and six annealing. The bar mill is already in place and the rolls have nearly all been placed in the housings of the sheet mills.

The first section of the new billet mill of the Bessemer plant of the Republic Iron & Steel Co., of Youngstown, O., was placed in operation last week for the first time. The plant operated smoothly and the engines were found to be in excellent working order. As soon as the remainder of the plant is completed the entire mill will be placed in operation.

The annual meeting of the stockholders of the Nova Scotia Steel and Coal Co., Ltd., was held last week at New Glasgow, N. S. A five per cent dividend was voted on the common stock and the usual eight per cent dividend on the preferred. Officers were elected as follows: John F. Stairs, president; J. D. McGregor, vice-president; Graham Fraser, managing director.

The Bessemer & Lake Erie Railroad is extending its dock facilities at Conneaut, O., very extensively by the erection of an addition to dock No. 4, 200 feet in length. Fifteen shifting engines have also been ordered for the Conneaut yards.

As the result of a strike at the Youngstown, O., plant of the American Bridge Co., the plant has been shut down for an indefinite period. The strike originated with the boy rivet heaters who asked for an advance in wages and spread to the other employes of the plant, who went on a sympathy strike.

There is no change in the strike situation at the plant of the Morgan Engineering Works, Alliance, O., the strikers remaining firm in their demands. On the other hand the places of the striking machinists have nearly all been filled by the company and the machine shop is in complete operation.

The offices of the Colorado Fuel & Iron Co., which have been located in the Boston building, Denver, Colo., have been removed to Pueblo, where a handsome new office building has just been completed.

The Rockwood Mfg. Co., Indianapolis, Ind., has applied for a temporary restraining order to prevent interference with its workmen by the molders who are now on a strike. The order was not granted, but a hearing will be had on April 15.

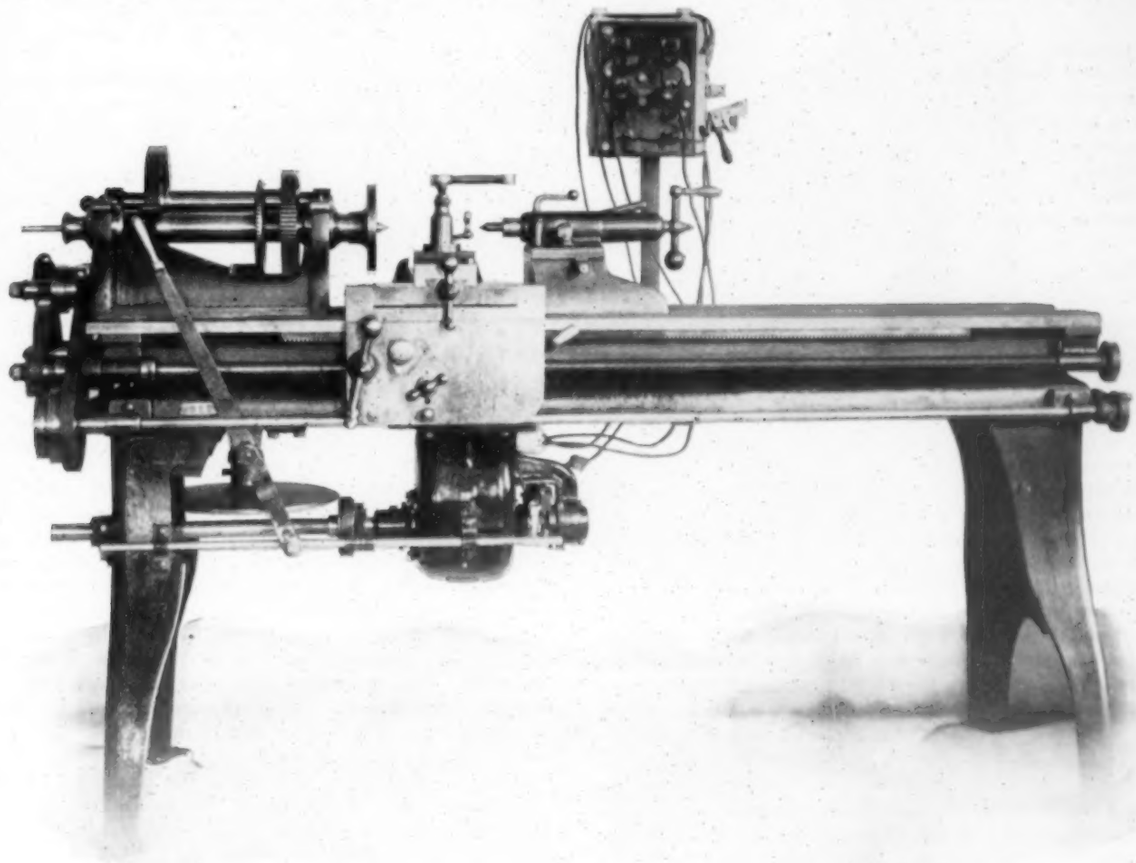
MOTOR DIRECT CONNECTED TO ENGINE LATHE.

An ingenious arrangement for driving a lathe by an electric motor has been designed by the General Electric Co. of Schenectady, N. Y. This device is illustrated in the half tone in which a standard type, 2½-h. p. motor, having a normal speed of 1,600 revolutions per minute at 500 volts is shown direct connected to a Reed 14-inch engine lathe. The motor is bolted to the lower side of the bed near its center. The shaft of the motor is extended from the pulley side until it reaches the head end of the lathe. Two bearings secure the shaft firmly and prevent it from springing when the machine is in operation. Extending along the shaft is a key way which engages with a movable pulley about 4 inches in diameter. The face of this pulley is covered with leather to prevent slipping when driving the lathe.

The pulley may be moved to various positions on the shaft by means of a lever extending upwords towards the head stock. A clamping nut secures the lever when the pulley is in any desired position. Directly above the extended shaft of the motor there is a vertical shaft rotating on ball bearings. At its bottom is a disk 14 inches in diameter which presses against the friction pulley. The upper end has a bevel gear for driving the lathe. The shaft is secured to the inside of the head by means of a special casting which does not interfere with any of the lathe mechanism.

The leather friction pulley is shown entirely clear of the disc and it will be evident that the motor may continue to run in such a position whilst the lathe is at rest. The latter may then be started gradually by pulling the lever to the right until the desired speed is obtained. The movement of the leather pulley beyond the center of the friction disc resulting in a reversal of the lathe and the same gradual lessening of the speed as the pulley nears the edge of the friction disc. The lathe may be reversed by a suitable double throw switch and this will avoid any necessity of the one friction pulley being applied at or near the center of the other.

Since the photograph was taken the electrical connections have been changed somewhat and a small controller is now used, obtaining by this means five different speeds of the motor. The main switch is located at a convenient place near the center of the lathe and the controller is placed at the foot end where it is not in the way. The controller is operated by a rod running along the lathe bed and geared to the controller cylinder. A small handle on this rod near the apron enables the workman to start the lathe in either direction. Any speed from 100 to 600 revolutions per minute can be obtained by varying the relative positions of the friction pulley and the disc wheel and by the use of the controller. The usual back-gear reduction of speed can be made in addition.



GENERAL ELECTRIC CO.'S MOTOR DIRECT CONNECTED TO ENGINE LATHE.

SUGGESTED AT THE SHOP.

BY F. O. REMAN.

I came to a somewhat hasty conclusion the other day when I sent in those clippings about the flying machines and kindred topics. It did really seem that I had cleaned up about all the literature then scattered around among the newspapers upon this breezy subject, but that is just where I miss my guess and there are probably any number of these items in circulation. The fact is that these things come along in a drove, and whether it happens to be the X-rays, liquid air, wireless telegraphy or the Keeley cure there are any amount of imitators and projected enterprises. Some of these are very suggestive and out of the recent bunch of clippings, I select one having an interesting bearing on the flying machine matter. The clipping is taken from a staid New York daily having a wide commercial circulation, and it may justly be inferred therefore that the facts given in the dispatch from Jackson, Mich., have not had the benefit of saffron imagination.

* * * * *

"It is announced from Meridian that Richard T. V. Mytton, draftsman for the New Orleans & Northeastern railroad, proposes to exhibit at the Louisiana Purchase Exposition a flying machine which he and his friends are confident will stand a chance to win a goodly portion of the big prizes offered for machines that will navigate the air. Mr. Mytton has already forwarded his models to a molder at Waltham, Mass., who is

instructed to make a gasoline engine of light weight, but strong and durable, the inventor being impressed with the idea that weight has a good deal to do with the problem. It is also stated that a Woodville, Miss., citizen has a perpetual motion machine that he will exhibit at St. Louis, but he is keeping the matter very quiet."

* * * * *

Evidently the draftsman has given the subject some attention and is wary of weight. He does not intend to be caught unawares and it is now up to the molder in Waltham to make good these anticipations. Nothing is said about any machinist being considered in this deal and probably the well established skepticism of the craft has lost the job in favor of some other fellow with more faith in flying affairs. It is really too bad that the otherwise commendable modesty of the inventor of the perpetual motion device should prevent the thing getting into print, but he has my sympathy and I would suggest that, if the scheme fails to time in due season, it may be turned over to the Waltham molder, who is very worthy of patronage from this class of clients.

* * * * *

I am getting a few other clippings sent from time to time about these notable improvements that are going on in the metal trades and one of these describes the wonderful work that is being done by a man in Indiana. The item is taken from an Indianapolis newspaper and concerns a steel process introduced by W. B. DePoy. I cannot reproduce this account in full, but will make a few extracts to prove how rich the prospect appears to be for the sanguine inventor.

* * * * *

"With the DePoy process any piece of steel may have its tensile strength increased from 40 to 75 per cent. A piece of cast iron may be welded as easily and securely after treatment in his solution as the best Norway or Sweden wrought iron and any tool formed from cast iron by the regular casting process may be tempered so that it will carry an edge superior to the steel now manufactured by the best known processes. One of the experiments was the manufacture of a razor from a wire nail of the 20-penny size. It was first swedged into knife form, ground and then tempered, and it has been used in shaving with as much success as the best razor manufactured. Another experiment at the Carnegie works in Pittsburg was the test of tensile strength of a piece of steel after undergoing the DePoy process. One half of a bar three feet long, three inches wide and one-half inch thick, was treated in the chemicals and the other half was untouched. The untreated half bore the tensile strength of 62,540 pounds and the treated half on the same testing machine bore a tensile strain of 97,862 pounds. The inventor claims that articles of cast iron under treatment are changed into the best of steel without a change in form."

* * * * *

Now this is just as clear and convincing as anything of the kind could be and it is equally interesting to learn that some nameless steel magnates have offered the inventor $50,000 for the process. It would be a great temptation to the average man to give up the secret for that sum and thereby avoid all the worry and anxiety of getting into the industrial whirlpool, but the enthusiastic inventor is in the game for keeps and is not likely to throw up the sponge for any paltry sum. Not much. Unless his expectations are shaky round the roots he will turn a trick that will surprise the haughty magnates of the steel world and some of these direct metal schemes will look mighty slim. But what a team he and the Waltham molder would make. There is no charge for this suggestion and here's hoping the two will get together while business in iron and steel circles is on the hustle.

* * * * *

The Baldwin locomotive works is announced as having recently celebrated the completion of its 20,000th locomotive. Some of the daily newspapers have given the effort of one reporter of this event at Philadelphia a wide circulation and, among sundry other things he has served up for the occasion, we are told that: "The products of this factory traverse darkest Africa, startle the pyramids and have penetrated to the Holy City." Maybe the pyramids will recover and perchance retaliate.

TRADE PUBLICATIONS.

Catalogue No. 19 of the Penberthy Injector Co., of Detroit, Mich., contains some additions not to be found in the company's earlier publications. A high and low water alarm is a new departure and is a purely mechanical device, the operative part being contained in the steam space of the boiler and when giving the alarm simply opens a valve and admits steam to the whistle. A new force-feed lubricator gives a positive action when attached to any moving part of the engine and is capable of extremely fine regulation. A cheap double connection lubricator has been added to the line of "Swift" lubricator.

The Baldwin acetylene lamps are the subject of a catalogue issued by the manufacturer, A. H. Funke, Duane street, New York. The construction and use of the lamp is clearly shown in the illustrations and there is considerable information in regard to the composition and relative illuminating power of calcium carbide and acetylene gas.

The Pittsburg Gage & Supply Co., of Pittsburg, has published a catalogue detailing the special merit of the White Star filtering system. The plan and apparatus are handsomely illustrated by a number of halftones and the descriptive matter is well arranged.

W. N. Brunton & Son, steel and wire manufacturers of Musselburgh, Scotland, have sent us a folder containing a table for calculating the tons per square inch, or pounds, on the section of any wire from .176 to .0125 and .012. The tabular arrangement is in a very compact form and the card will no doubt be found very useful by those who have many of those computations to make.

"The Wire and Sheet Gauges of the World" is the title of a booklet prepared by Arthur Lee & Sons, Ltd., of the Crown steel and wire mills, Sheffield, England. The want of a uniform guage has led the author to undertake the task of calculating the various tables on the basis of a common reduction to ten-thousandths of an inch and arranging them so as to be readily comparable with each other, also with millimeters and the common divisions of the inch scale. The subdivision is very thorough and inclusive of the range from .001 to .5 of an inch.

M. H. Treadwell & Co., engineers, founders and builders of special machinery, 95 Liberty street, New York, have issued a very neat deckle-edge leaflet under the title "A Formula for Sure Success." This is composed of "30 per cent patient, persistent dig, dig, dig, at it every minute; 30 per cent reputation (founded on fact, for honest dealing every time; 10 per cent fortunate circumstances caught on the fly; 20 per cent snap; 10 per cent more persisten dig." To work out this formula "a clear head and as little worry as possible, not any, if it can be helped," are necessary. "The chief worriment in a manufacturing plant comes from machinery"—and right here the advertising feature of the leaflet introduces itself.

The R. D. Nuttall Co., of Pittsburg, has prepared a book of some ninety pages for the benefit and convenience of those interested in gears. A number of plain and concise rules are given for the calculation of gearing and a selection of tables which will be found useful in drafting room or shop practice. The work is neatly printed in two colors, bound in cloth, and contains a number of pages of squared paper.

The recent catalogue of the E. W. Vanduzen Co., of Cincinnati, is descriptive of a line of steam jet pumps, siphons, special pumps and barge pumps. The present catalogue supersedes all others treating of the above lines. These pumps are said to be capable of lifting water to the height of 16 feet vertically and will force to the height of 50 feet.

The Armstrong Bros. Tool Co., of Chicago, has a new catalogue and price list of tool holders, etc. Among the recent additions and changes is the new line of clamp lathe dogs and planer jacks, the changed form and enlarged cutters in all the straight and offset-shank tool holders. The changes introduced materially increase the capacity of the tools, the present No. 2 being practically equivalent to the former No. 3 but the prices remain as heretofore. A number of new sizes have been added to the list of tool holders.

An excellently illustrated catalogue has been received from the Binsse Machine Co., Newark, N. J. The catalogue is entitled "The Tool for Precision in Boring" and is a treatise upon the construction and use of the Binsse horizontal boring machine.

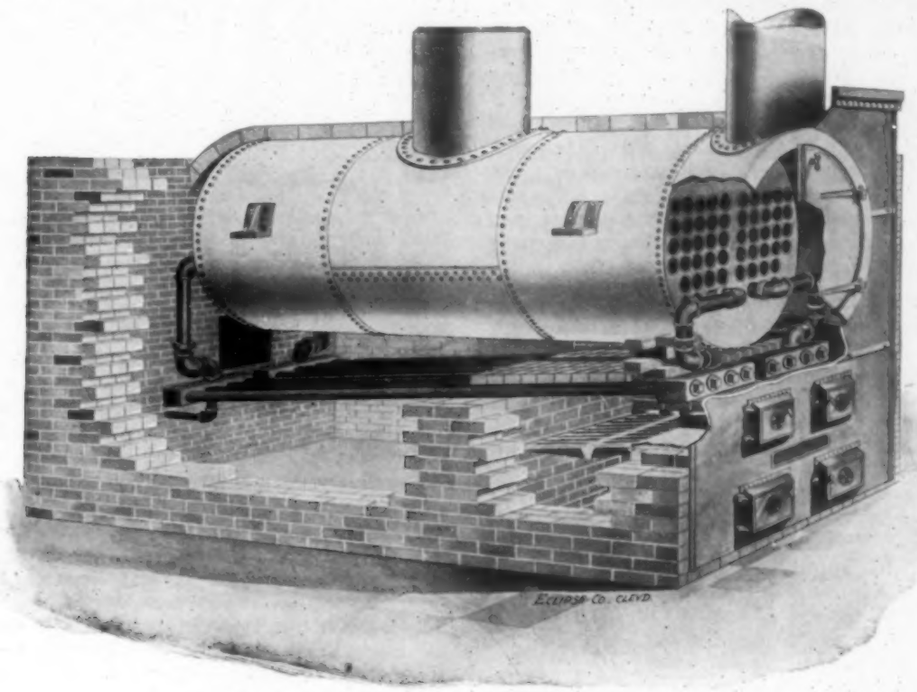
STEAM GENERATOR.

The accompanying illustration is of a device for the generation of steam. The Ohio Steam Generator Co. which is putting it on the market is composed of Cleveland men, largely interested in manufacturing and who are known to take advantage of anything that will result in a saving. As can readily be seen, the device consists of two banks of water tubes, expanded into headers front and back, and connected in both heads of the boiler, to two tube openings, from which the fire tubes have been removed. The water tubes are inclined from the back to the front at an angle sufficient to insure a rapid as well as a positive circulation. The front headers are kept away from the heat of the fire by being laid in the arch above the firing doors.

The connections between the headers and the boiler heads are formed with double swings, to allow for all expansion and the weight of the generator is carried by the brick work at these points, thus relieving the connections in the heads of all strains. It will be noticed that the spaces between the tubes directly over the grates are covered with fire brick, except in the center, where sufficient space is left for the products of combustion. This construction permits of a more thorough mixture of gases and air and result in a more perfect combustion than otherwise obtained. This fact, together with the tnin neating surfaces, a well known factor in the rapid and economical production of steam, produces a great saving in coal, as will be seen from the results of the tests given below. The addition of the heating surface increases the efficiency of the boiler and makes it possible for those desiring modern boiler practice to obtain the same at a low cost, without making a complete change of plant. While it is not claimed to be a smoke consumer, its use naturally results in reduction of the volume of smoke, due to the better combustion of the coal.

The construction of the generator being along the lines of the best known boiler practice assures its safety and durability, while its simplicity and ease with which it can be attached to a boiler, without changing the setting, seem to commend it as a most practical device. The water tubes are continued from the back headers through the back wall, where they are blanked, making it easy to examine and wash them out. The design of the generator has been favorably passed upon by Mechanical Engineers, Boiler Insurance Companies and practical steam users. To those who are forcing their boilers beyond an economical degree and to those who desire to obtain the greatest value from their fuel, the device has been especially commended and demonstrations have been had with good results. The following are partial details of comparative tests made at two plants on boilers of the same size running under different conditions:

TEST NO. 1.	Date Aug. 6, '01 Plain	Date Aug. 23, '01 Generator
Kind of fuel.....Pittsburgh	Slack	Same Car
Average steam pressure	60	60
Pounds of coal burned	2849	2170
Pounds of combustible	2262	1503
Coal burned per hour, pounds	356	271
Coal burned per sq. ft. grate, per hour, lbs	11.87	10.63
Coal per horsepower, per hour, lbs.	4.55	3.34
Total water evaporated, lbs. actual conditions	19575	20010
Water evaporated from and at 212°, lbs	21805	22351
Water evaporated per hour, from and at 212°, lbs.	2733.16	2794
Water evaporated per lb. coal, actual conditions	6.87	9.22
Water evaporated per lb, coal, from and at 212°	7.67	10.30
Water evaporated per lb. combustible actual conditions	8.65	11.19
Water evaporated per lb. combustible. from and at 212°	9.66	12.39
Efficiency (B. T. U. utilized)	56.98	76.52
H. P. on basis of 34½ lbs. per hour, from and at 212°	78.22	81
Per cent saving of coal with Generator, 25.53.		



THE OHIO STEAM GENERATOR CO 'S STEAM GENERATOR.

TEST NO. 2.	Date Oct. 19, '01 Plain	Date Oct. 29, '01 Generator
Kind of fuel.....Ohio	Run Mine	Run Mine
Average steam pressure	80	80
Pounds of coal burned	7000	5350
Pounds of combustible	6098	4493
Coal burned per hour, lbs	875	668.75
Coal burned per sq. ft. grate, per hour, lbs	24.30	18 57
Coal per horsepower, per hour, lbs	6.41	4.77
Total water evaporated, lbs., actual conditions	34500	35511
Water evaporated from and at 212°, lbs	37635	38672
Water evaporated per hour, from and at 212°, lbs...	47 4	4834
Water evaporated per lb. coal, actual conditions...	4 93	6 64
Water evaporated per lb. coal, from and at 212°	5.36	7.23
Water evaporated per lb. combustible, actual conditions	5.66	7.90
Water evaporated per lb. combustible, from and at 212°	6 16	8.61
Efficiency (B. T. U. utilized)	47.06	63.48
H. P. on basis of 34½ lbs. per hour, from and at 212°	136 34	140.01
Per cent saving of coal with Generator, 25.86.		

The office of the Ohio Steam Generator Co. is in the Williamson Bldg., Cleveland, and the officers and directors are: Willard Fuller, president and general manager; J. C. Trask, vice president; A. T. DeForest, secretary and treasurer; S. H. Chisholm and P. R. Crawford.

Colonel Watanabe, military attache at the Japanese legation, Washington, is said to have been instructed by his government to inspect several of the more important electrical engineering and manufacturing plants throughout the United States with a view to the placing of contracts, especially for arsenal equipment. Colonel Watanabe is now on a tour of Central Western works, including those of the Carnegie Steel Co., the Westinghouse Electric & Mfg. Co., of Pittsburg; the Brown Hoisting Machinery Co. and the Wellman-Seaver-Morgan Engineering Co., of Cleveland.

THE IRON RESOURCES OF TEXAS.*

BY DR. WM. B. PHILLIPS.

It is not the purpose of this paper to deal *in extenso* with the various deposits of iron ore in Texas. The matter has been threshed over so many times in the publications of the Geological Survey of Texas, in the technical journals, and in the Transactions of the American Institute of Mining Engineers, that one may be pardoned for not mentioning every deposit and quoting analyses innumerable.

It has been known for many years that in the eastern, or rather in the northeastern, part of the State there are extensive deposits of good limonite (brown ore), and that in the central part, in the county of Llano, etc., there are deposits of hematite and magnetite of excellent quality but unknown extent. It is also known that up to this time no workable deposits of coking coal have been found in the State. So far as concerns the fuel question and local production of pig iron, Texas must use charcoal, or bring in coke from the Indian Territory, Colorado, New Mexico, or Alabama. With our present lights we can put to one side the use of lignite as fuel in the blast furnace. Whatever success might accompany its use in a small furnace and on a very limited scale (and this is problematical), no metallurgist or blast furnace manager could advise the use of it on a commercial scale. There may be one or two little tea-pots using lignite and making a few tons off-grade iron in some out-of-the-way places, but in this country the use of lignite as a blast furnace fuel is not even a will-o'-the-wisp—it is merely a belated lightning bug trying to get home before sunrise.

Cost of Texas Pig Iron—Ore Supply.

It is a fact that in Northeast Texas and in the counties of Rusk, Marion, Cherokee, Cass, there are deposits of good limonite of sufficient extent to warrant operations on a large scale. These ores are of the usual brown ore type, and carry from 45 to 50 per cent of iron and from 0.30 to 0.60 per cent of phosphorus. It is also a fact that they can be mined cheaply and that washing, for the most part, would not have to be resorted to. It is also a fact that these ores have been and are now used for the production of charcoal iron, and the total output of such iron from 1872 to the end of 1900 was 120,438 tons. Pardon me, but it is also the fact that this iron has an excellent reputation and buyers of charcoal iron are anxious to get it. And yet the industry languishes. Why it languishes is too long a story now. As this is not a discourse on the diseases of the iron business, we will forbear.

In an instructive paper read before the American Institute of Mining Engineers, Virginia Beach meeting, 1894, Mr. Wm. Kennedy, an engineer resident in Texas and familiar with the East Texas iron ore belt, took occasion to say that the probable cost of the production of charcoal iron in east Texas was $12.01, which, in a postscript subsequently added, he reduced to $9.50. The testimony that was given before a Committee of Inquiry, 27th Legislature of Texas, 1901, was to some extent confirmatory of this lower cost. Mr. Kennedy's items of cost were as follows:

COST OF MAKING A TON OF CHARCOAL IRON IN EAST TEXAS.

2½ tons of ore, @ 82c	$2.05
110 bu. of charcoal, @ 4c	4.40
½ ton of limestone, @ $1.50	0.75
Labor and salaries	1.50
Interest	0.30
Repairs and incidentals	0.50
	$9.50

I think that this would probably represent the lowest cost, and that the average cost would be nearer $11 than $9.50, under present conditions. It is only in East Texas that pig iron has been made, and the only ores that have come into use are the limonites of that region. The hematites and magnetites of Llano county, in Central Texas, 100 miles northwest of Austin, represent the best types of these ores. Some recent analyses of samples taken in person are as follows:

ANALYSES OF LLANO COUNTY MAGNETITE.—O. H. PALM AND S. H. WORRELL.

Metallic Iron	66.33 per cent.	64.40 per cent.	64.40 per cent.
Silica	2.38 " "	6.52 " "	6.54 " "
Alumina	2.69 " "	trace	trace
Lime	none	none	none
Magnesia	none	none	none
Sulphur	0.44 " "	trace	trace
Phosphorus	0.032 " "	0.048 " "	0.045 " "

* A paper read before the Engineers' Society of Western Pennsylvania.

These ores were fully discussed by Theodore B. Comstock in the first and second annual reports of the Geological Survey of Texas, 1889 and 1890, and there is but little to add to what was said then. Few or no other developments have been made, and the matter stands now just where it did then, in so far as concerns our knowledge of the extent of the deposits. The average of 5 analyses of Llano county magnetites given by Dr. Comstock is as follows:

AVERAGE COMPOSITION LLANO COUNTY MAGNETITES.—ANALYSES BY J. H. HERNDON AND L. MAGNENAT.

Metallic Iron	63.31 per cent.
Silica	4.67 " "
Alumina	5.74 " "
Lime	0.57 " "
Magnesia	trace " "
Sulphur	0.092 " "
Phosphorus	0.064 " "

With respect to phosphorus it must be said that of the 5 analyses quoted 3 showed a trace, 1 showed 0.02, and the other 1.02 per cent. Excluding this last as abnormal, we would have a very small amount of phosphorus in these ores. And yet these analyses clearly indicate that, while ores extremely low in phosphorus are to be found in this region, there is a possibility of their carrying more than the Bessemer limit of this element. The ores would be subject to rigid inspection and analysis if sold as Bessemer ores. The average of six analyses of Llano county hematies, given by Dr. Comstock, is as follows:

AVERAGE COMPOSITION OF LLANO COUNTY HEMATITES.—ANALYSES BY J. H. HERNDON AND L. MAGNENAT.

Metallic Iron	56.43 per cent.
Silica	5.59 " "
Alumina	7.86 " "
Lime	1.44 " "
Magnesia	trace
Phosphorus	0.15 " "
Sulphur	0.091 " "

It is to be noted that in one of the samples there was 3.12 per cent of phosphorus, corresponding to 7.16 per cent of phosphoric acid. This is a most unusual amount of phosphorus in ore of this character. On the other hand two of the samples showed a trace of phosphorus. The alumina is high, one of the samples giving 17.11 per cent, another 14.50 per cent, the average running to 7.86 per cent. There are other parts of the Central mineral region that yield good magnetites and hematites, as the counties of Gillespie, Mason, McCollough, etc.

In Llano county considerable prospecting was caried on 10 or 12 years ago, at Bessemer, 8 miles east of the town of Llano, and at Iron Mountain, 15 miles northwest of Llano, on the magnetites of these localities. South of Iron Mountain a diamond drill hole was carried down to a depth of 600 feet, with the following reported section to 517 feet:

SECTION OF BORE-HOLE, SOUTH OF IRON MOUNTAIN, LLANO COUNTY.

Granite	301 feet.
Magnetic ore	40 "
Granite	25 "
No core but thought to be ore	13 "
Granite	27 "
Chloritic rock and granite	36 "
Magnetic ore	7 "
Granite and schist	13 "
Granite	55 "
	517 feet.

An analysis of the ore from this property was made by Andrew McCreath, Harrisburg, Pa., with the following results:

ANALYSIS OF ORE FROM BADER MINE, SOUTH OF IRON MOUNTAIN, LLANO COUNTY.

Metallic Iron	64.15 per cent.
Silica	7.28 " "
Titanic Acid	0.38 " "
Phosphorus	0.014 " "

Attractive as are some of the iron ores of this region, from a chemical standpoint, it cannot be said that they have been sufficiently prospected to enable one to speak with confidence of their extent. In places they seem to be of commercial importance, and at one time it was hoped that they would be mined. But the enterprise fell through, and the machinery that had been installed was removed. For several years nothing has been done.

Of late, however, there has been a revival of interest in these ores, as well as in those of East Texas. It was stated that, so far as known, there were no deposits of coking coal in Texas. This statement applies to such coal as is now mined and to the ordinary bee-hive coke oven. But it is well known that some coals which do not yield good coke in a bee-hive oven, do yield a fair coke in a recovery oven, such as the Sol-

vay, the Hoffman, the Carves, the Huessener, etc. We are no longer restricted to the use of the bee-hive oven, for the improvements in the so-called recovery ovens now allow the use of an inferior coal for coking. I do not mean to say that the coke is as good as it would have been if better coal were used, but that it can be successfully used in the blast furnace. In other words, we can now make passably good coke from coal that would have been considered entirely unsuited for the purpose a few years ago. This fact has an important bearing on the utilization of the Llano county ores. A study of the map of Texas will show that the shortest route from the town of Llano to the producing coal fields, we will say to Strawn, in Palo Pinto county, is 347 miles. If coke were made in Palo Pinto, Erath, Eastland, or Stephens, it would have to be hauled 350 miles to the ore, or the ore hauled 350 miles to the coke. But there will be built this year a connection between the Houston & Texas Central Ry. at Burnet to the Gulf, Colorado & Santa Fe Ry. at Lampasas, 30 miles, that will reduce this distance to 280 miles, a gain of 70 miles.

Furthermore, it is not improbable that among the undeveloped coals of Stephens county, north of the Texas & Pacific Ry. at Bangor, there may be found some more suitable for coking than those already opened in that part of the carboniferous area. To open the Stephens county coal would require from 20 to 30 miles of road, so that we may say that the distance from the Llano ore fields to the coal fields, even after the completion of the Burnet-Lampasas branch, will be about 300 miles. It has been proposed to use the Llano county ores in furnaces already built, mixing them with the brown ores spoken of. The distance from Llano to the nearest blast-furnace, viz., at Rusk, is 293 miles (the New Birmingham furnace is near Rusk), while to the furnace at Jefferson, Marion county, it is 370 miles. It is about the same distance from Llano to the nearest furnace as from Llano to the coal fields, and if Llano ore should be hauled to Rusk, New Birmingham, or Jefferson, it woulld have to be turned into charcoal iron, for the furnaces in east Texas are not built for coke iron.

Outside Coke and Ore.

But it has also been proposed to bring Indian Territory coke into the east Texas ore district. This would necessitate an all rail haul of 270 miles to Jefferson, and also to Rusk and New Birmingham. The east Texas ore fields are about 270 miles from South McAlester. So far as our present knowledge goes, we can say, therefore, that the shortest haul between the Texas iron ore districts and coking coal is 270 miles. If coking coal should be discovered in the Texas carboniferous the haul to the Llano ore district would be 300 miles, and to the east Texas ore district about the same. The Indian Territory coke would have an advantage of 30 miles as against Texas coke in the east Texas ore fields, but Texas coke—supposing, for the moment, that we had Texas coke—would have an advantage of 180 miles in the Llano ore district. Now, a 30-mile haul, in a total distance of nearly 300 miles, cuts but a slighht figure, so we may say that, if coking coal can be developed in the Texas carboniferous, it would compete on equal terms with Indian Territory coke in east Texas, and would have a decided advantage in the Llano district.

It has also been proposed to export the Llano ores, by way of Galveston, to Baltimore, or Philadelphia, or even across the Atlantic. From Llano to Galveston is 319 miles, but little more than from Llano to the coal fields. Whether Llano ore can find a market in this way remains to be seen. The distance from Galveston to Baltimore is 1,800 nautical miles (making the total distance from Llano to Baltimore 2,390 statute miles), while the distance from Santiago de Cuba or Daiquiri (large ore exporting ports on the southeast coast of Cuba) to Baltimore is 1,300 nautical miles. It would require an ore of exceptional purity and of guaranteed composition to compete successfully with Jurugua or Spanish-American ore in markets already familiar with Cuban ore. The duty of 40 cents per ton on imported ore plays no great part in this matter, for it is rebated if the materials manufactured from it are in turn exported.

Still another plan has been suggested of late, and that is to ship Llano ore to Missouri furnaces, or to the furnaces at East St. Louis, in Illinois. The distance from Llano to St. Louis is 918 miles, and it is to be supposed that the chief reason why this long all-rail haul is considered at all is because of the uncertainties and delays attending the shipping of Lake ores to these furnaces during the winter months. From St. Louis to Duluth is 884 miles, by way of Burlington, Cedar Rapids and St. Paul. From Duluth to Mountain Iron, the heart of the Mesabe Range, is 72 miles, making the distance from St. Louis to Mountain Iron 958 miles, as against 918 miles from St. Louis to Llano.

To some of the Old Range or Wisconsin mines from St. Louis it is not so far as to Duluth; probably ore could be laid down at St. Louis with a 750-mile haul. But, at any rate, the distance from St. Louis to available ore in the North is less than from St. Louis to the Llano ores, while the freight rates are also less. Of course, some lake ore is hauled by rail to points from 800 to 1,000 miles distant, but the conditions seem to be such as would not readily maintain were the attempt made to ship Llano ore as far as this by rail. The enormous output of the lake mines, the regularity of the car supply and other industrial factors, outweigh the shortage due to occasional blizzards and seasons of very cold weather.

Iron and Steel Consumption in Texas.

What demand is there in Texas for pig iron, or bar iron, or rolled shapes of iron or steel? This question cannot be answered definitely, because there is no practical way of collecting the actual statistics. We know, of course, that Texas is an agricultural and grazing State, for the most part, and that industries other than agriculture which require large quantities of iron and steel have not yet been developed. The farming industry in Texas is certainly very large, and steadily growing larger. It requires a great deal of iron and steel, taking one year with another, and these supplies are furnished almost entirely from beyond State limits. The population of the State is increasing rapidly, having gained 36 per cent between 1890 and 1900, leading all the Southern States. It is now 3,048,710. The railroad mileage, June 30, 1901, was 10,153 miles. There are now about 60 foundries in the State, and possibly half a dozen good machine shops, excluding those owned and operated by the railroads. I made the attempt to gather certain data from the foundries, and to this end sent out a letter to each one asking replies to the following questions:

1. Where do you get your pig iron?
2. What kind of pig iron do you use?
3. What class of castings do you produce?
4. What is your daily capacity in tons?

Replies were received from 40 establishments, representing more than 95 per cent of the foundry business in Texas. The replies to the first question show that the pig iron used comes from Texas, Alabama, Tennessee, Georgia and Ohio. There were seven that used Texas iron exclusively and three that used Texas iron in conjunction with Alabama iron. One firm writes: "We get our pig from Alabama, but would prefer Texas if we could get it." Another, and a large and important establishment, writes: "We beg to say that for several years past, not being able to get a supply of Texas pig iron, which we much prefer to any other brand for use in our business, we have been forced to use pig iron made in Alabama and Georgia." A large consumer of pig iron in the Central West said to the writer recently that he had endeavored to secure a three-year contract for Texas iron, but had been unsuccessful because of the alleged inability to supply the amount desired. Of the establishments replying, eighteen used Alabama pig exclusively, while eleven used Alabama pig in connection with pig from other States. It appears that Alabama iron is used more extensively in Texas than any other kind. The kinds of pig iron brought here are, of course, Nos. 1 and 2 Soft, and the regular foundry grades, even as low as No. 4 F, which is sometimes known as foundry forge.

The class of material turned out includes machinery, and architectural work, engine and mill castings, farming implements, light steel castings used in plows (one establishment), railroad, bridge, hydraulic oil press, in fact nearly all kinds of castings. There is no malleable iron plant in the State.

The daily capacity was 271 tons, distributed among 36 establishments. Most of the establishments, however, are small, eight of them accounting for 190 tons, leaving 81 tons for 28 plants. Three of the establishments report a total daily capacity of 135 tons, these three having 25, 50 and 60 tons respectively. Not all of the total daily capacity of 271 tons is to be considered as pig iron, for a considerable amount of scrap is used, the exact proportion not being known, depending, as it

does, upon the kinds of castings required, etc. Perhaps one would be safe in assuming that one-half of the total daily capacity represents the pig iron used, in which case we would have 135 tons. I think it would be safe to assume 100 tons a day as the average consumption of pig iron, *as such*, in Texas, or 30,000 tons a year.

Of the consumption of pig iron in manufactured form there are no statistics, but we may arrive at a practical conception through the weight of the cotton ties used in bagging the crop of 1900. This was about 13,500 tons, worth $1,500,000. The average cost of the ties is 50 cents per bale, and crop of 1900 was in excess of 3,000,000 bales of 500 pounds each. Not allowing for any wastage between pig iron and cotton tie —although there is, of course, a considerable waste, utilized, however, in other ways—we have 43,500 tons of pig iron consumed annually by the Texas foundries and by the makers of cotton ties used in bagging the Texas cotton crop.

To this must be added the wire fencing, wire nails, jobbers hardware, architectural, agricultural and railroad iron, etc., which would, I think, bring the total up to at least 60,000, tons a year, exclusive of steel rails, merchantable steel, and malleable castings. In other words the amount of iron made in Texas from 1872 to 1900, a period of 29 years, would just about supply the demand of two years, excluding rails, steel and malleable castings.

Now the question is, can a considerable proportion of the pig iron used in Texas be made in Texas and from Texas materials? This is purely a business matter, and has nothing to do with sentiment. It is strictly a matter of dollars and cents, and must be regarded solely from this standpoint.

There is plenty of ore in the State and of a quality that is very largely used elsewhere; can it be utilized? Considering the fact that, so far as now known, there is no coaking coal in the State, the manufacturers of pig iron must depend upon the use of charcoal as fuel, or upon coke brought in from the Indian Territory, the nearest source of supply, over a distance of 270 miles from the east Texas district, and 480 miles from the Llano district. The only native fuel is charcoal. Coking coal may be discovered and brought into use, but at the present time the only known fuel is charcoal, for lignite is not in the running.

There is an opportunity in east Texas for the production of charcoal iron, and a 50 or 60 ton furnace would probably do well there. The product would find a ready sale in Texas, for there are four foundries already in operation that would consume the entire product. As already remarked, the iron that has been made there has a good reputation and is in demand, specially by the makers of car-wheels and plow castings. An output of 60 tons per day could readily be marketed at satisfactory prices. It is true that the charcoal and limestone would have to be hauled considerable distances, but even under these conditions it is not improbable that iron could be made for $10. I am aware that the charcoal iron industry has been in a decadent condition for several years, and that the present output of about 300,000 tons is nearly 300,000 tons less than for 1890. But here is a territory that is to a large extent cut off from the great centers of iron production and yet uses 100 tons of pig iron a day for foundry purposes. The decadence of the charcoal iron industry merely goes to show that coke iron has taken its place in certain districts and for certain purposes: it does not prove that it could not be established in Texas. The Texas iron trade is essentially a foundry trade and the largest establishments would be glad to get charcoal iron, and this is substantiated by numerous letters now in my possession.

Furthermore, a steel cotton-tie and wire plant, making also small steel castings, would have a very large area within which to market its products. Of cotton-ties alone the three States of Arkansas, Louisiana and Texas in 1900 used $2,211,000 worth. It is impossible to speak positively of the wire trade, for there are no statistics available, but it is not unlikely that it is worth, in these three States, $500,000, making a total for cotton-ties and wire of $2,711,000.

A charcoal furnace for foundry iron and a coke furnace for iron destined for the steel plant, pipe, etc., would probably be an advisable combination. Beaumont oil or Corsicana residuum could be used for fuel in the steel furnace, as also in the foundry, and could be delivered within the iron ore district of east Texas for 40 cents per barrel. The distance from Beaumont to Rusk is 158 miles, and from Corsicana to Rusk 120 miles, from Beaumont to Jefferson 262 miles, and from Corsicana to Jefferson 158 miles. Recent contracts for the delivery of the Beaumont oil within distances varying from 250 to 300 miles have been made at 44¼c per barrel. The Nacogdoches oil field (not, however, producing now) is within 80 miles of Rusk, and 148 miles of Jefferson, so that the estimate of 40c a barrel for Beaumont oil in the ore district is certainly not too high, and it is likely that it could be delivered for a price considerably below this. At 40c a barrel and four barrels per ton of coal we would have $1.60 as the price of oil equivalent to a ton of coal. It is to be observed, of course, that the oil is for use only in the puddling furnaces, in the steel furnaces, or in foundries (for core ovens, etc.). It cannot be used alone, or in admixture with lignite, as a blast furnace fuel. I would not tax your patience with this statement were it not for the fact that I have received letters of inquiry on this very point. There seems to be a belief in certain quarters that crude oil can be used in the blast-furnace in place of coke or charcoal, but this belief is not shared by those who are familiar with the requirements for blast furnace fuel. As you know, it takes a good deal more than mere heating power to supply the demands of a blast furnace. Crude oil is valuable for many purposes, but the time has not yet come when it can supplant solid fuel for iron making. Coke, anthracite coal, splint coal and charcoal will continue to be used long after we have passed away.

The Commercial Side of Iron-Making in Texas.

From an examination of all known facts and reasonable deductions therefrom, I think it probable that iron making could be established in Texas on a commercial scale and with fair prospect of success. There is nothing like enough iron produced in the State to supply the present demand, the State is growing rapidly and many industries are springing up, consequent, among other causes, upon the discovery of large stores of cheap fuel oil.

Within 175 miles of Rusk and in Texas alone there is a daily capacity of the foundries in excess of 225 tons, pig iron and scrap, of which about one-half is pig iron. Within a distance but little further from Jefferson the same statement holds good. The ore fields of east Texas are within two hundred miles of the most densely populated region in the State, and one that is increasing in wealth and in iron-consuming power every year. It is true that the east Texas iron ores are not of a high grade, but they are of as good a quality as brown ores generally, and in the country at large there were mined in 1900, 3,231,089 tons of ore of no better quality. The lowest average value per ton of ore in 1900 was reported from this State, 82c a ton. This may have been due to the fact that convict labor is employed, but experience elsewhere has shown that convict-mined ore and coal are but little, if any, cheaper than the coal and ore mined with free labor. The main benefit derived from the use of convict labor, is, perhaps, due to the uninterrupted control of it, not to any marked decrease in the cost of production aside from this fact.

Texas Blast Furnaces.

There are four furnaces in Texas now, all of them built for charcoal, and all of them in the east Texas district. These are as follows:

Jefferson Furnace, Jefferson, Marion county. One stack 60x12, built in 1889-91, blown in March 15, 1891. Two Durham iron stoves. Capacity, 13,500 tons. A rolling mill was partly finished in 1891, and was designed to contain 15 single puddling furnaces, three heating furnaces, and three trains of rolls (one 18-inch muck and one 8-inch, and one 12-inch bar).

Old Alcalde Furnace, Rusk, Cherokee county, owned by the State of Texas. One stack 55x9½. Built in 1883 and put in blast February 27, 1884. Hot blast. Capacity, 7,000, tons. A pipe foundry is connected with the furnace.

Star and Crescent Furnace, near Rusk, Cherokee county. One stack 65x11. Built in 1890-91 and blown in November, 1891. Iron stoves. Capacity, 18,000 tons.

Tassie Bell Furnace, New Birmingham, Cherokee county. One stack 60x11, built in 1889-90, and blown in November, 1890. Two Weimer pipe stoves. Capacity, 13,500 tons.

During the last ten years, therefore, there have been four charcoal furnaces capable of making iron, with a total annual capacity of 52,000 tons. But during this period, i. e. from

1891 to 1900, inclusive, the total amount of iron made was only 71,412 tons. With a total capacity during these ten years of 520,000 tons the actual output was 71,412 tons, or 13.7 per cent of the capacity. We have the statistics of the production of pig iron in Texas since 1872, with the exception of two years, 1875 and 1878, when the output may have been 500 tons each. The total amount of pig iron produced during these 29 years, 1872-1900, inclusive, was 120,438 tons. As already remarked, this is about enough to supply the demand for four years, while the furnaces in the State could produce it in 28 months.

We have not considered other deposits of iron ore in the State, as, for instance, in El Paso county, west of the Pecos river. But little is known of them, although some excellent samples have been received. Some of the El Paso ores closely resemble the Llano magnetites. They lie at some distance from rail, and may not be available. They occur in the Quitman Mountains, the Sierra Diabolo, Sierra Carrizo and Chinatti. In the Quitman Mountains,,, according to Von Streeuwijz, carbonate of iron is also found. In Gonzales and Caldwell counties, near Harwood, on the Southern Pacific Railway, 64 miles east of San Antonio, there are beds of limonite of good quality.

In this paper the attempt has been made to consider the iron resources of the State in a general way, without inquiring into the merits of any particular deposit of ore or of any special location. The conclusions reached are as follows:

1. There are extensive deposits of limonite in east and northeast Texas, carrying from 45 to 50 per cent of iron, but not suited for the manufacture of Bessemer iron. These ores can be cheaply mined, and can be delivered to the furnace for 80c to $1 a ton.

2. There are deposits of magnetic and hematite ores in Llano, Mason, Gillespie, etc., of unknown extent, but of excellent quality.

3. The only available fuel is charcoal, unless Indian Territory coke can be brought in.

4. The total daily capacity of the foundries in the State is 271 tons, pig iron and scrap, of which at least 100 tons is pig iron.

5. There is an active and steady demand for Texas iron, and there would be little difficulty in marketing 100 tons a day within a distance of 150 to 200 miles.

6. The demand for pig iron, as such, is about 30,000 tons a year. Cotton ties call for 13,500 tons more, while wire fencing, wire nails, etc., would probably call for 16,500 tons. Exclusive of steel rails, merchantable steel and malleable castings, the consumption of iron, taken as pig iron, is probably about 60,000 tons a year.

7. The annual average production of pig iron in the State during the ten years, 1891-1900, is 7,141 tons, leaving 23,000 tons to be brought in from other States.

8. The cost of producing charcoal iron in east Texas should not exceed $11, and may be reduced to $10. On account of the long haul for coke, it is not likely that the cost of coke iron would be much less than that of charcoal iron.

Claims For Damages Against Violent Strikers.

A molders' strike is on at the Rockwood Mfg. Co.'s plant at Indianapolis. In a newspaper statement the firm says that the trouble began March 3. A boy of 19 was taken on as an apprentice and a contract entered into to teach him the trade. The union molders in the department demanded his discharge. The company refused because of the contract. A strike followed. The company brought in non-union men. They were followed to their homes by strikers; in many cases there were assaults, one man being brutally set upon and beaten in front of his house. One employe who had worked for the company 14 years and another, aged 60, who had been with them 21 years, were knocked down and a riot call to the police was necessary. Failing in getting sufficient protection from police the company went into United States Court for an injunction.

Judge John H. Baker declined to issue a temporary restraining order, but promised to cite the defendant molders, including the walking delegate, to appear before him April 15. Judge Baker said the condition of the company's affairs was a disgrace to the State and the city authorities. He said it was the duty of the sheriff and the mayor to stop the assaults, instead of the United States Court. "Would it not be a good plan," Judge Baker asked, "to let these assaults go on until the people of Indianapolis arise in their might and give these men who want to work the protection they need?" If this plan were followed, he said, things might reach a point where the people would hold courts of their own on street corners and deal with the strikers. He said the men who wished to work for the Rockwood company had a right to strap revolvers about them and carry shotguns as they went to and from the factory, and that they could with these arms protect themselves. A man could carry a rapid-fire gun, Judge Baker said, and protect himself, so long as the weapon was not concealed.

"I want you to change your bill of complaint," Judge Baker said. "I want you to include in it a prayer for damages. It does not matter whether these men have any property or not. I will appoint a special master to fix the damages, and if you secure judgments against these strikers, officers can, if the men are caught in bed, take away their clothing. They can have no property that will be exempt under the State laws. The judgment will keep them in insolvency as long as they live, or until the judgment is paid. Things have come to a pretty pass when the city of Indianapolis will not give the men who want to work protection from men who do not want them to."

ESTIMATION OF SULPHUR BY THE EVOLUTION METHOD*

BY HARRY E. WALTERS AND ROBERT MILLER.

The estimation of sulphur in iron is a subject upon which a great deal has been written, and if apologies are necessary for our contributing to the literature of the subject, we can only say, that we think that the method which we present in this paper, solves the problem of securing an accurate estimation by the evolution method. Dr. Phillips of this society has shown that in using the evolution method, organic sulphur compounds are formed, which are quite volatile and pass through the absorbing solutions, and recently, Shimer and Blair, in a paper read at the Mexico meeting of the American Institute of Mining Engineers, have proven the presence of a carbon-sulphur-titanium compound in some irons which is insoluble in hydrochloric acid and point this out as a further source of error in using the evolution method.

Most of the investigations were carried on with white irons, while in our investigation we have found the variation in results to be as much and in most cases more in grey irons. It was suggested to us that if the sample be weighed off and then annealed in a non-oxidizing gas, that all of the sulphur could probably be obtained by the evolution method. Samples of coke, foundry and cast irons, as well as a sample of iron containing titanium, were obtain and treated as follows:

1. The sulphur was evolved by the regular evolution method, using an ammoniacal cadmium chloride solution to absorb the hydrogen sulphide and titrating the cadmium sulphide with iodine.

2. The sample was weighed into a porcelain boat and annealed in a porcelain tube in a current of natural gas or hydrogen. After annealing the sulphur was evolved and estimated as in (1).

3. The sulphur was estimated by the gravimetric method.

The first sample tried, was a sample taken from an iron casting, which had been cast in sand. This sample showed .057 sulphur by the regular method. The sample, after being annealed and then evolved, as in the first case, showed .071 sulphur. The average of five results by the gravimetric method was also .071 sulphur. From these results it will readily be seen that after annealing, all of the sulphur was evolved as hydrogen sulphide.

These results were so encouraging that the rest of the samples were then tried, and in every case, the result obtained after annealing, checked with the gravimetric result. Experiments were then instituted to find the amount of time which the annealing should require, and it was decided that for ordinary irons, 15 minutes would be sufficient, but if the samples contained an appreciable amount of titanium, they should be annealed one half hour.

The method finally decided on was as follows: Weigh 5 grams of the sample into a porcelain or copper boat and place in a thin porcelain or nickel tube, which is then placed in a

*A paper read before the Chemical Section of the Engineers' Society of Western Pennsylvania.

combustion furnace, pass a current of natural gas or hydrogen through the tube a couple of minutes to expel the air and then ignite at the end of the tube. Now light the burners under the tube and turn on the gas so that the flame will just encircle the tube, and anneal at a bright red heat 15 minutes to one half hour. At the expiration of this time turn out the burners and allow the tube to cool while the current of gas continues. This will require about 7 to 10 minutes. When cool, remove the boat from the tube and transfer the sample to a suitable flask and evolve the sulphur with dilute hydrochloric acid (1 acid 1 water). Absorb the evolved hydrogen sulphide in an ammoniacal cadmium chloride solution. Titrate with an iodine solution of theoretical strength.

The following results will show how well the method compares with the gravimetric method:

SAMPLE.	REGULAR EVOLUTION METHOD.	EVOLUTION AFTER ANNEALING 15 MIN.	Br Cl 2 METHOD.
1 Iron casting.	.057	.071	.070
	.057	.071	.071
			.071
			.071
			.073
2 Shot Sample.	.034	.039	.038
3 " "	.034	.039	.039
	.045	.031	.052
	.046		
4 " "	.049	.059	.059
5 " "	.080	.085	.086
		.084	
7 " "	.026	.026	.026
8 " "	.036	.035	.034
9 " "	.052	.051	.053
10 " "	.072	.078	.077
11 " "	.125	.132	.130
724 " "	.032	.031	.030
	.030	.030	.032
730 " "	.052	.051	.049
	.049	.050	.050
740 " "	.083	.081	.081
	.080	.082	.080
769 " "	.115	.119	.118
740 Pig	.081	.081	.080
	.080	.079	.080
2 Iron castings.	.025	.034	.030
	.024	.036	.034
	.025	.032	.034
B	.038	.056	.056
	.038	.055	.054
	.040	.057	.057
C	.059	.076	.076
	.059	.075	.074
	.060	.074	.075
12 Pig iron.	.044	.076	.076
	.043	.076	

Shot sample 2-11 came from the Edgar Thomson Furnaces, Duquesne Furnaces and the Carrie Furnaces of the Carnegie Steel Co. and Dr. Phillips of the Western University. Shot samples 724, 730, 740 and 769 are from the Isabella furnace. These samples were heated to redness before being crushed. This probably accounts for the results of the three methods checking so closely. Sample of pig iron 740, is from the same cast as the shot sample 740. Samples B. and C. are the American Foundrymen's Association standards. No. 12 is a sample of iron containing titanium and 2.44 per cent silicon, and was kindly furnished to us by Mr. P. W. Shimer, of Lafayette College. It required 30 minutes annealing on this sample.

We think that the method as outlined above is practical because it requires but one hour to make the determination, and if a tube of large bore be used a large number of samples may be annealed at the same time. While we should have liked to present more results, and also to have tried annealing in nitrogen and carbon dioxide, we could not find the time to perform any more experiments. We think that either of these gases will act as well as hydrogen or natural gas, and furthermore believe that if shot samples are heated to redness before they are crushed, they will need no further annealing, and all the sulphur will be evolved as hydrogen sulphide.

The American Rolling Mill Corporation, The Rookery building, Chicago, will start up its Muskegon (Mich.) mill, which has been undergoing repairs for some time, April 22nd. The machinery has been entirely overhauled and the plant enlarged. It now consists of a 20-inch muck train, 18-inch finishing and 19-inch finishing mills, and will have a capacity of 1,000 tons of finished bar iron per day.

Two large shipments of armor plate have been made by the Bethlehem Steel Co. The first comprises a train load of finished side armor for the new battleship Ohio, now building at the Union Iron Works, in San Francisco. The other consists of 22 armor plates for the Russian battleship Alexander III. This was shipped to Jersey City for export.

OBITUARY.

Daniel W. Leeds, secretary and treasurer of the Crescent Iron Works, Elizabethport, N. J., died as the result of blood poisoning at his home, Elizabeth, N. J., on March 26. He is survived by a widow and three sons.

Alexander Duncan Forbes, president of the Rockford Malleable Iron Works, Rockford, Ill., died at his home in Rockford on Sunday evening, March 30. He was born in Deanston, Perthshire, Scotland, Dec. 13, 1831, and came to America in 1842. In 1854 he became a resident of Rockford, and during that year, in partnership with his father, Duncan Forbes, established a foundry and engaged in the manufacture of stoves and machinery castings on the waterpower. Mr. Forbes was one of the first men in the West to see the possibilities of malleable iron manufacture, and in 1864 the firm established the first malleable iron works west of Cincinnati. The business later grew into the Rockford Malleable Iron Works, of which Mr. Forbes was president.

William Imhauser, widely known as a manufacturer and inventor of watchman's time detectors, died at his home in Ronkonkoma, L. I., March 28. Mr. Imhauser was 77 years old and was a native of Germany, where he introduced watchman's time detectors. He came to the United States in 1867 and started in business for himself as a manufacturer of time detectors in 1869. Later he obtained a number of patents on improvements in these instruments, which were notable in the world of invention. He received many medals of award from expositions for his work in this line. Mr. Imhauser was active in business until about five years ago, when ill health caused him to retire.

William R. Snead, president of the Snead & Co. Iron Works, of Jersey City, N. J., died March 27. Mr. Snead was president of the company after the retirement of his father, who now lives in Louisville.

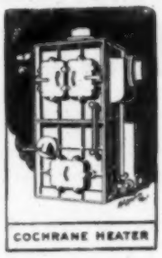
Albert Judd Blakeslee, president of the Blakeslee Mfg. Co., DuQuoin, Ill., died in the latter part of March at the age of 78 years. Mr. Blakeslee was the inventor of the steam pump and veneering machine bearing his name.

Alexander D. Forbes, president of the Rockford Malleable Iron Works, Rockford, Ill., died on March 30.

The American Idea of Output in England.

British shipbuilders have been restricted in the use of American riveting machines by the unwillingness of the men to use them, or at least to use them effectively, and one British firm has just imported a considerable number of American riveters to teach Scotch mechanics how to use the pneumatic machines whose advent has caused great uneasiness among the union riveters. An American contractor has just convinced hundreds of British bricklayers that instead of laying three or four hundred bricks a day they can lay 1,800 in nine hours, and the American riveters will show the Scotchmen that by the use of machines they can earn as much, and pretty certainly more, than by hand, that their employers will be able to take contracts at lower prices, and as a consequence of this that more orders for ships will go to British yards. The only reason that American and German competition has been dangerous to Englishmen is that in this country and Germany the costs of production have been reduced. When England makes up her mind to join the industrial procession she will discover that she is about as good a manufacturing country as she ever was.—[New York Journal of Commerce.

The balance sheet of the Diamond State Steel Co., as of Dec. 31, 1901, is as follows: Assets—Cost of real estate, plant, etc., $4,386,943; rolls, patterns, small tools, $153,214; stock, bonds, etc., owned, $54,295; accounts and bills receivable, $404,817; stock on hand, $595,987; cash, $331,549; interest, insurance and taxes paid in advance or accrued, $9,547; total assets, $5,936,355. Liabilities—First mortgage bonds, $1,000,000; preferred stock, $2,250,000; common stock, $2,000,000; accounts and bills payable, $639,489; net profit for eight months, $46,866; total, $5,936,355. The net profit, $46,866, is the balance after deducting from the gross profit, $164,899, the following items: Renewals and repairs, $51,366; depreciation, $40,000; bond, interest, $26,000.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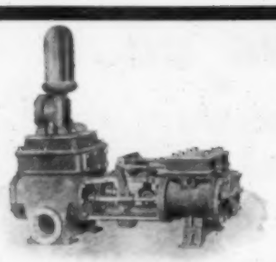

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Hexagon Nuts, Studs, Etc. **SCREWS.** Coupling Bolts Specials.

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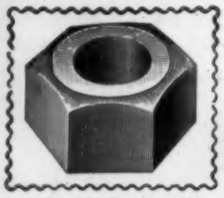
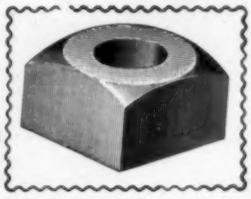


COLD PUNCHED NUTS



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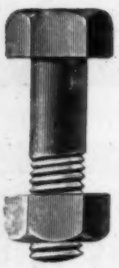

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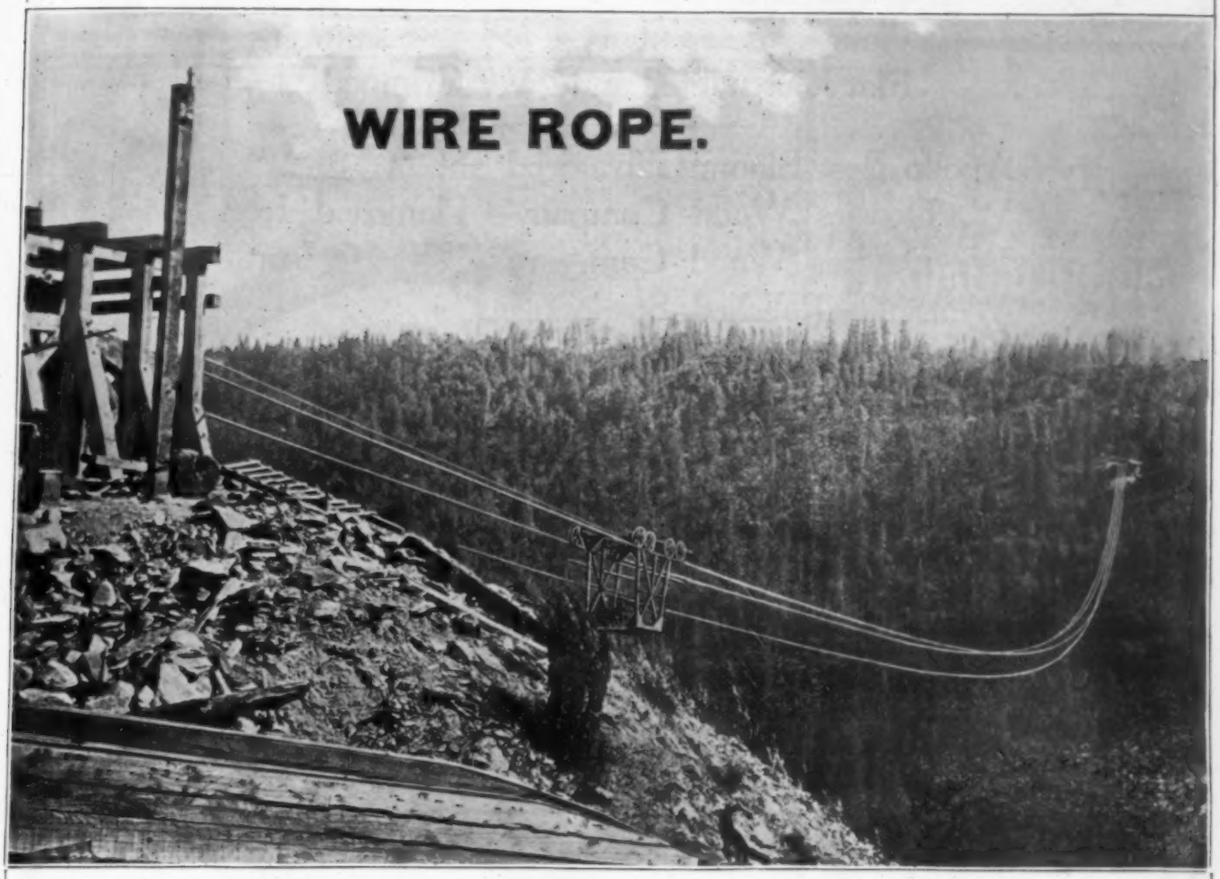

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Graphite through the metal breaks up vibration.

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Annealed and Galvanized Fence Wire.
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